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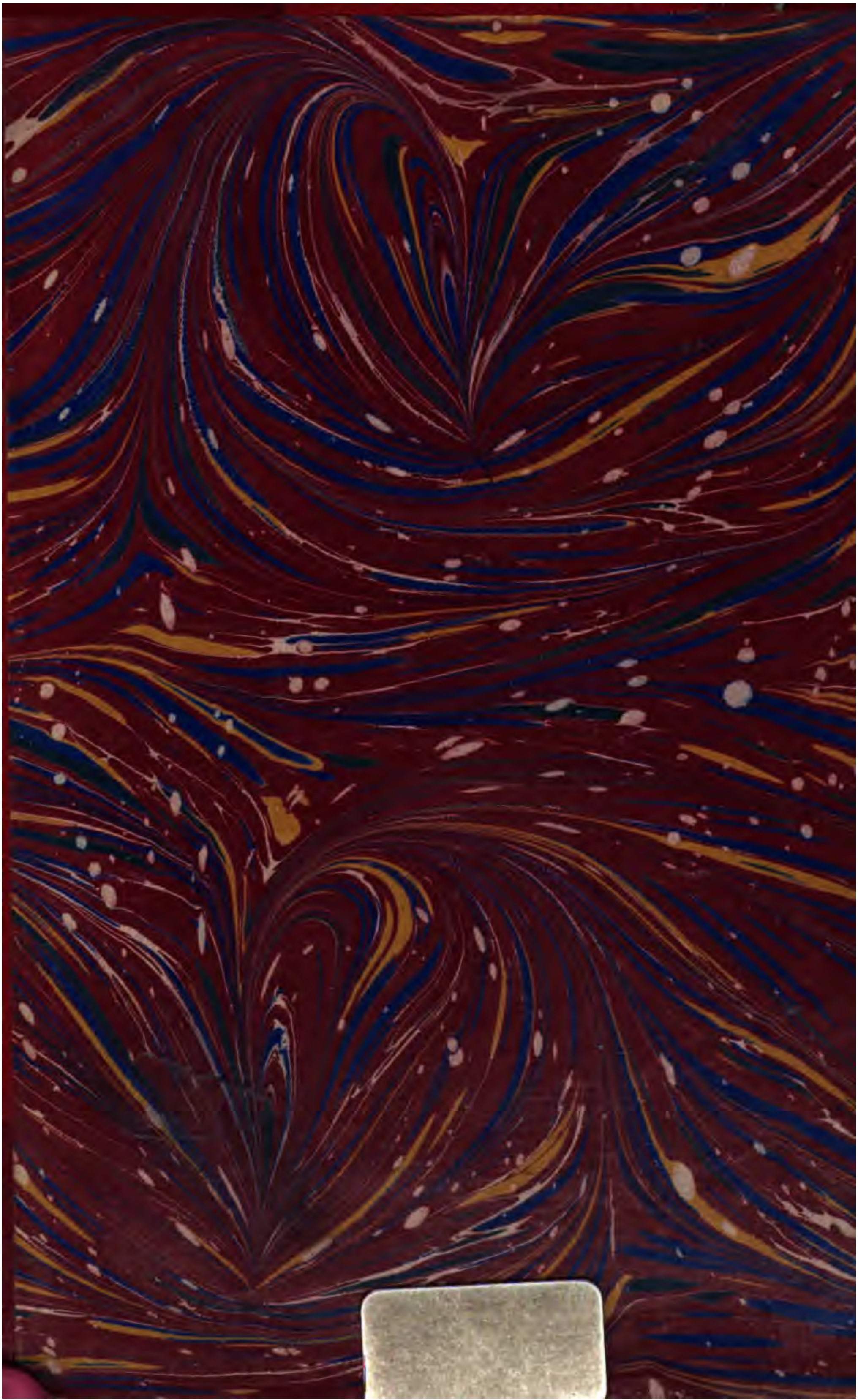

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DEPARTMENT OF THE INTERIOR.

BULLETIN

OF

THE UNITED STATES

GEOLOGICAL AND GEOGRAPHICAL SURVEY

OF

THE TERRITORIES.

F. V. HAYDEN,

U. S. GEOLOGIST-IN-CHARGE.

1878.

15 JUL 85

VOLUME IV.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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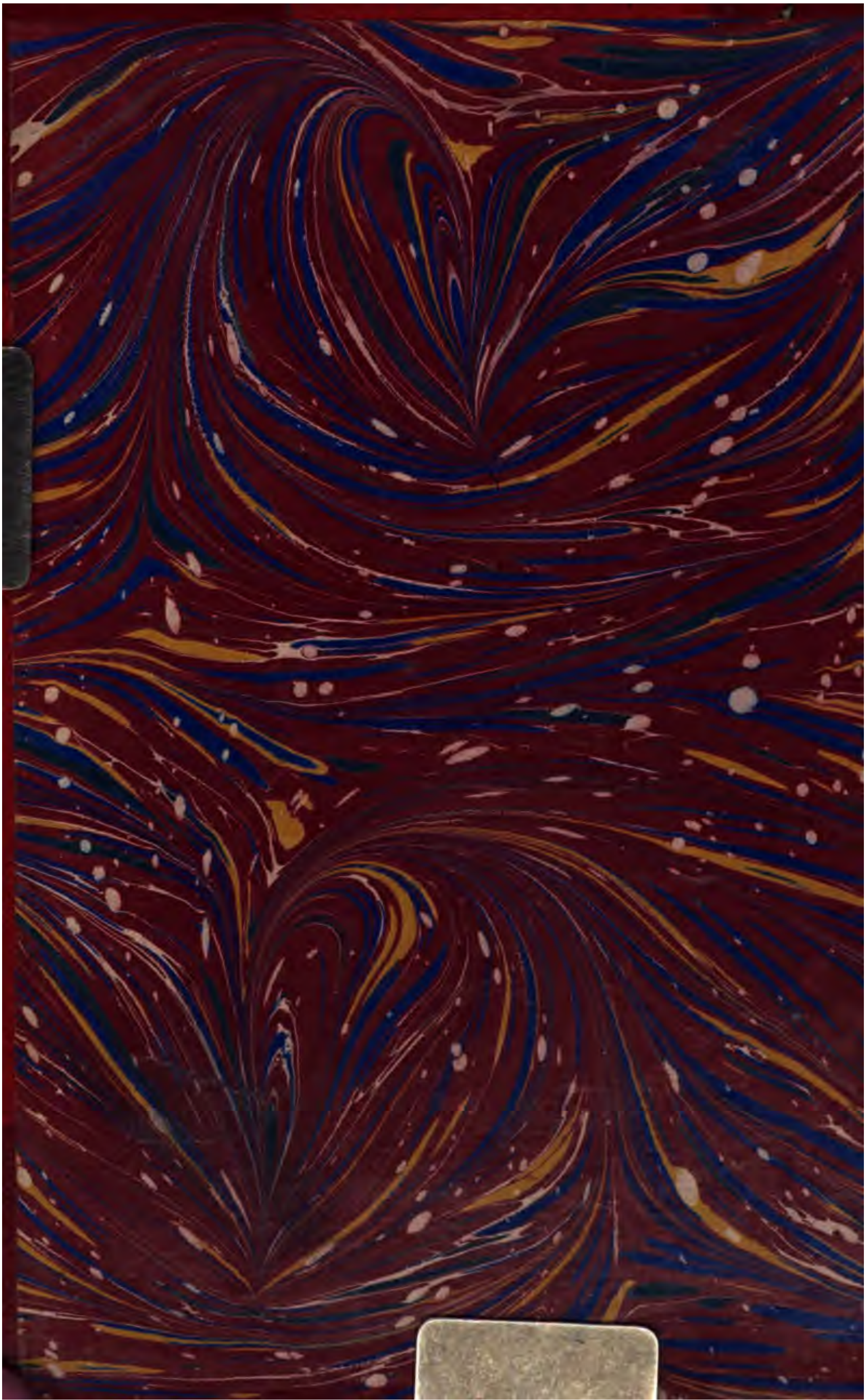

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1878.

PREFATORY NOTE.

U. S. GEOLOGICAL AND GEOGRAPHICAL
SURVEY OF THE TERRITORIES,
Washington, November 30, 1878.

Bulletin No. 4, series of 1878, completes Volume IV; and with this number are issued index, title-page, table of contents, list of illustrations, &c., for the whole volume. The separately published numbers should be preserved for binding, as there is no issue of the Bulletins in bound volumes from this office, and as back numbers cannot always be supplied to complete deficient files.

In concluding the fourth volume of Bulletins, a word regarding the origin and progress of this publication will not be out of place. The issue began in 1874, when it was found desirable to establish more ready means of communication with the public and with scientific bodies than the regular Reports of the Survey afforded; the design being to publish, without the delay incident to the appearance of more elaborate and extended articles, such new or specially interesting matter as should be contributed to the general results of the Explorations under my charge by the members or the collaborators of the Survey. The practical importance of prompt measures in such cases is well recognized, and sufficiently attested by the success which the Bulletins have achieved.

The First and Second Bulletins, which appeared in 1874, are separately paged pamphlets, without ostensible connection with each other or with subsequent ones, but together constituting a "First Series" of the publication. Bulletins which appeared in 1875, being those of a "Second Series" and six in number, are continuously paged. With No. 6 were issued title, contents, index, &c., for all the numbers of both "series" which had then appeared; the design being that these should together constitute a Volume I, in order that the inconvenient distinction of "series" might be dropped.

With Bulletin No. 1 of 1876, the publication was established as an annual serial; the four consecutively paged numbers of that year constituting volume II.

The four Bulletins of 1877 constituted Volume III, which compared favorably with its predecessors in the extent, variety, and importance of its contents, and was greatly improved in typography and general appearance.

The four Bulletins of 1878 form Volume IV, which maintains the same high standard of excellence.

Should no unforeseen circumstance prevent, the Bulletins will continue to be issued at convenient irregular intervals, as material may come to hand; the strictly serial character of the publication being maintained. The actual date of issue is given on the temporary cover of each, as it is important to fix with precision the appearance of the successive numbers of a periodical in which so many new genera and species are described.

This publication, answering so fully the special purpose for which it was established, is regarded as one of the most important means to the main ends which the Survey has in view. It has already acquired a character and standing which render it favorably comparable to the regular "Proceedings" or other similar publications of any of the learned bodies of this country or Europe. Its scope includes the whole range of the subjects for the investigation of which the Survey is conducted, and the appearance of which in this connection does not in any way restrict the plan of the formal Reports of the Survey. The volumes already issued contain articles upon Archæology, Ethnography, Linguistics, Geology, Topography, Geography, Palæontology, and Natural History in general, suitably illustrated with plates, cuts, and maps; and no effort will be spared in the future to maintain the high standard which the present volume so conspicuously illustrates.

The thanks of the Survey are due to Dr. Elliott Coues, U. S. A., for his careful and able conduct of the periodical.

F. V. HAYDEN,
United States Geologist.

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ART. I.—NOTES ON THE ORNITHOLOGY OF THE LOWER RIO GRANDE OF TEXAS, FROM OBSERVATIONS MADE DURING THE SEASON OF 1877.

By George B. Sennett,
Of Erie, Pa.

Edited,* with annotations, by Dr. Elliott Coues, U. S. A.

LETTER OF TRANSMITTAL.

Erie, Pa., *December* 1, 1877.

Sir: In transmitting these notes on the ornithology of the Lower Rio Grande, allow me to preface them with a few remarks.

Last winter, having inclination and leisure to prosecute the study of birds in a more extended field than was open to me at home, I began to look about for a suitable locality. As is always the case when real desire for study arises, avenues of investigation opened in all directions; but the weight of influence drew me to the Rio Grande. Arranging with Mr. F. S. Webster, of Troy, N. Y., to go as my assistant, and securing a complete outfit, I set out for Texas on February 23d of the present year. My plan was to work down the lower coast of Texas, and arrive at Brownsville, as a base of future operations, before the breeding season had fairly commenced. On the evening of the 20th of March, after many vexatious delays, we arrived at Brownsville, our objective point. The country worked over lay between Point Isabel, on the coast, near the mouth of the Rio Grande, and a point a few miles above Hidalgo, embracing a distance of a hundred miles by road or three hundred miles by river. We were exactly two months on the southern border. Much valuable time was lost in going up and down the river, in procuring means of conveyance, and in acquainting ourselves with the country. The annoyances also were not a few. On some days the weather was so intensely hot that birds were apt to spoil before we could prepare them. While we were constantly on the alert for huge rattlesnakes, tarantulas, and centipedes, yet more troublesome enemies were with us continually in the shape of wood-ticks and red-bugs, to say nothing of

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*[The editor's notes are bracketed and followed by his initials. Having inspected most of the collection, which was courteously submitted to his examination by Mr. Sennett, he is responsible for the identifications of nearly all the species, as well as for his *technical* commentary.—E. C.]

the fleas. The wood-ticks we could pick off or dig out, but the abominable "red-bugs", as they are called, too small to be seen, worked themselves through the clothes and into the skin, making one almost wild with intense itching. We only obtained partial relief by giving ourselves, from head to foot, before going to bed, a bath of ammonia, and a daily bath of kerosene oil before going into the brush. Under such circumstances it requires courage and enthusiasm to persevere in any pursuit.

The result of the trip was the securing of some five hundred birds, three of which are new to our fauna and one new to science; about a thousand eggs, many of which are new or rare; a few mammals, nearly all of which proved interesting; a number of alcoholic preparations of birds, mammals, and reptiles; and quite a collection of insects, principally *Lepidoptera*. The birds and mammals you have inspected; the rarer eggs have been exchanged with Dr. T. M. Brewer, Capt. C. Bendire, Dr. J. C. Merrill, Mr. E. Dickinson, Mr. Webster, and others. The alcoholic specimens have been sent to Prof. B. G. Wilder, of Cornell University, and the *Lepidoptera* to Mr. J. A. Lintner, of Albany, N. Y.

In nomenclature and classification of the birds herein treated, I have followed your "Key to North American Birds", subject, however, to your present revision. I have endeavored to avoid repetition of matters already published in other works, although I may have failed in this in some cases, as my facilities for examining the literature of the subject have been limited.

To the following persons who have extended kindnesses to me, with ready coöperation in my labors during the trip, I present acknowledgments: To Mr. Webster, for his industry and valued assistance. To Lieutenant Davis, in charge of Coast Survey at Galveston, for courtesies shown and assistance rendered in getting to and from points about the bay; and also to Major Lane, in charge of government works at Bolivar Point, for hospitalities freely extended. To Mr. and Mrs. R. E. Halter, of the Coast Survey, at Padre Island, for most opportune hospitality when weather-bound for several days on that desert spot. To Mr. Dean, collector of customs, and Mr. Leo, sheriff of Hidalgo County, both at Hidalgo; to Dr. Finley, acting assistant surgeon U. S. A., in camp near Hidalgo; and to Mr. Bourbois, at Lomita ranche, a few miles above Hidalgo, for assistance and numerous courtesies. To Dr. J. C. Merrill, U. S. A., post-surgeon at Fort Brown, for his very valuable assistance and hearty coöperation in my work.

And now, Sir, to you I owe, most of all, my hearty acknowledgments for your kindness in identifying the collection of birds and mammals, and in editing these notes, and for other courtesies rendered.

Very truly yours,

GEO. B. SENNETT.

Dr. ELLIOTT COUES, U. S. A.,
Secretary United States Geological and Geographical Survey.

TURDIDÆ.

MIMUS POLYGLOTTUS, (*L.*).—*Mockingbird.*

First seen in great numbers at Corpus Christi. On the Rio Grande it was everywhere abundant. There can little new be said about a bird so common throughout the South, yet I will give an item or two that may be interesting to some. When I saw him he was in good song. He is a capital mimic; and many and frequent were the maledictions on his pate, when, after long watching, and perhaps a shot through the thick bushes, instead of some expected prize, he made his appearance. I believe there is no bird-note he cannot imitate. While at work at our birds in the court-house at Hidalgo, we were several times greeted with the screeching "cha-cha-la-ca" from the low bushes on the river-bank but a few rods distant. Feeling positive that there could not be a Texan Guan within half a mile of us, we yet went out to satisfy ourselves, and found the cry to be that of a Mocker in excellent imitation of the chachalaca refrain.

The Mockingbird commenced laying on the Rio Grande about April 1. Our first eggs were taken April 5. I know of no eggs having greater variations in markings and ground-color. They varied from a ground-color of the very palest bluish-green and a pure green to a pure buff, and in markings from fine specks over the entire egg to great reddish-brown blotches, principally on the large end. The largest egg measured 1.25 by 0.72; the smallest, 0.90 by 0.67; the average of a large lot was 0.98 by 0.72. Many sets were examined. Young birds were first seen about May 1.

*30—♂—10.50 x 15.00 x 4.62 x 4.87. Mar. 9, Corpus Christi.

HARPORHYNCHUS RUFUS LONGIROSTRIS, (*Lafr.*) *Cs.*—*Long-billed Thrush.*

Of the Thrushes on our extreme southern border, I found the Texas Thrasher next to the Mockingbird in point of numbers. Usually they keep out of the sight of man, even when their home is invaded and the bird driven from the nest. I do not remember of their making any cry of grief at such depredation. One day in April, while concealed in a dense thicket close by some heavy timber, a pair of this species gave me pleasure for a full half hour. This, I think, was the only time I ever saw them for more than a moment or two at a time. The male was nearly as full of song as a Mockingbird, and his notes seemed much sweeter, not being so loud. They kept very near each other, the female giving frequent little chirps. I was unable to see any peculiarities distinct from the habits of its nearest relative, *H. rufus*, excepting that it was more arboreal, and built its nest much higher. I found their nests numerous, secured a score or more sets of eggs, and examined many that I did not take. My observations are so much at variance with the description of these nests in the "History of North American Birds", by Baird, Brewer and Ridgway, that I will quote from these authors before giving my experience. "Their nests are usually a mere platform of small sticks or coarse stems, with little or no depression or rim, and are placed in low bushes, usually above the upper branches."

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* In these lists of specimens, the first number is that of the specimen. The sign for sex follows. The next four numbers indicate respectively the length, extent of wings, length of wing, and length of tail. Other measurements are preceded by the name of the part. Date and locality follow.

I found none without a lining, either of grasses, Spanish moss, fine roots, or bark. There was a marked depression in every nest, the depression varying from one inch to two and one-half inches. Of those taken, the lowest was four feet from the ground and the highest some eight feet, averaging, I think, five and one-half feet. I found their nests in a variety of places—prickly-pear cactus, Spanish bayonet, chaparral, and most commonly in the dense undergrowth under the heavier timber. I saw no nest of this bird in an exposed position "above the upper branches". Its usual position is in the very heart of the tree or plant selected, and, like most of the nests of this region, not capable of being detached from the thorny bushes without falling to pieces. I found the birds and nests of only three Thrushes, viz: *M. polyglottus*, Mockingbird; *H. curvirostris*, Curve-billed Thrush; and the one now under consideration; and I doubt very much the ability of any one ordinarily to tell one nest from the other, either by structure or position. The usual complement of eggs is four; in fact, I found but one clutch of five. The eggs are marked very much like those of *H. rufus* (Brown Thrush), and are hardly distinguishable from them. The typical egg has a ground-color of the faintest greenish-white, and is finely speckled all over with brown, the dotting being thickest at the larger end. Several sets were obtained with the ground-color yellowish-white, and so thickly speckled as to have a general color of ochre. One set is nearly pure white, speckled thickly only in the form of a wreath at the larger end, otherwise very sparsely and faintly marked. The shape is usually uniform, like all the Thrushes'; but I have one egg shaped exactly like a Quail's egg. The largest egg was 1.12 by 0.84, and the smallest 1.01 by 0.75. The average length was 1.07, and breadth 0.78.

134—♀—11.62 x 13.50 x 4.12 x 4.75. Apr. 2, Brownsville.
297—♀—11.50 x 13.25 x 4.00 x 5.00. Apr. 29, Hidalgo.
383—♀—11.00 x 13.00 x 3.85 x 5.00. May 6, Hidalgo.

HARPORHYNCHUS CURVIROSTRIS, (*Sw.*) *Cab.—Curve-billed Thrush.*

This Thrush, though frequently seen, is not so common as *H. longirostris* (Long-billed Thrush), and is readily distinguished from it. I did not meet with it until we reached Brownsville, on March 20th. The very first day at that place, it was seen about the brush-fences just outside of the city. The bird is very retiring in its habits, never more than one or two being seen together, and even less inclined to sing in exposed places than its near relative, *H. longirostris*. I do not remember hearing its song, but I am told by the residents of the country that it sings very sweetly in secluded places, but never in confinement. Ordinarily, one would expect to find its nest in very secluded thickets. The first nest secured was at Hidalgo, April 17. Its location was beneath the roof in the broken side of a thatched outhouse in the very heart of the village. A more exposed place for human view could not be found, nor was there in the village a yard more frequented by children; yet I could not imagine a safer retreat from its more natural enemies—Hawks, Jays, &c. The female was shot as she came from the nest; and with little difficulty I took the nest entire, with its complement of four beautiful, fresh eggs. The average size of nest was about that of an ordinary four-quart measure, although, from its irregular shape, it would not set into one. Its depth outside was fully six inches, with an inside depth of two so that when the bird was on, though only six feet from the ground, nothing but its head and tail could be seen. The nest was composed of twigs from the size of a lead-pencil down, and lined with dry grasses. This description will apply to the several others found, with this difference: some were smaller, and in this instance greater care was taken to intertwine the sticks, so that it would hold well together. On April 28th I found a nest and four fresh eggs only three feet from the ground, in a thicket, not far from a nest of *H. longirostris*.

On May 10th, while on horseback, I came upon a prickly-pear cactus, wonderful to me for its size and tree-like shape. Its trunk was the size of a man's body, and some of its branches were above my head as I sat on my horse. Its general form was that of a wine-glass. While peering about and poking the stalks with my gun, I discovered in the very heart of the great cactus a nest and four eggs of this Thrush. It was about five feet from the ground, perfectly exposed above, yet nothing could be more secure from all sides. Not a sign was to be seen of the parent bird, not a note heard, yet I felt sure a pair of golden eyes were peering out of some neighboring thicket. The eggs once identified could not be mistaken for those of any other bird of the region. With some difficulty I secured the eggs, wondering in what other extraordinary place I should find the nest of this species.

The shape of the eggs is like that of the Brown Thrush's, only longer. The ground-color varies from a pale to a rich pea-green. The markings are brown, evenly and finely scattered over the entire egg. The largest egg out of twenty measures 1.18 by 0.80 of an inch, the smallest 1.03 by 0.79. The length ranges from 1.20 to 1,03, averaging 1.12 of an inch. The breadth ranges from 0.82 to 0.72, averaging 0.79 of an inch.

133—♂—11.38 x 14.75 x 4.37 x 4.25. Apr. 2, Brownsville.
161—♀—11.00 x 13.25 x 4.12 x 4.25. Apr. 5, Brownsville.
222—♀—10.50 x 13.00 x 3.87 x 4.00 Apr. 17, Hidalgo.
272—♀—10.75 x 13.50 x 4.25 x 4.25. Apr. 25, Hidalgo.
371—♂—11.00 x 14.12 x 3.88 x 4.12. May 5, Hidalgo.
373—♀—11.00 x 14.25 x 4.25 x 4.25. May 5, Hidalgo.

SAXICOLIDÆ.

SIALIA SIALIS, (*L.*) *Haldeman.—Bluebird.*

On May 3, in the vicinity of Hidalgo, I shot the only pair of these birds seen on the Rio Grande. I first shot the male, and, while picking it up, its mate, with dry grasses in its mouth, flew into an old Woodpecker's hole, in a dead stub near by, and was soon secured.

348—♂—7.25 x 12.50 x 3.85 x 2.62. May 3, Hidalgo.

SYLVIIDÆ.

POLIOPTILA CŒRULEA, (*L.*) *Sclat.—Blue-gray Gnatcatcher.*

I have no knowledge of seeing this bird more than once or twice, and no specimens were obtained. A handsome nest and clutch of eggs were taken by Dr. Merrill in April in the vicinity of Brownsville.

PARIDÆ.

LOPHOPHANES ATROCRISTATUS, *Cass.—Black-crested Titmouse.*

These lively and sweet singers were everywhere abundant, especially in old lagoon-beds, now largely grown up with the mesquite and lignum vitæ. Although so common, we were unable to find their eggs. The only nest discovered contained young, and was situated in the split fork of a tree, some ten or twelve feet from the ground. The exact number of young could not be determined, but there were certainly five or six. On May 3d, I came upon a whole family, the young of which had nearly obtained their growth. I shot one adult and five young, and at least three young escaped. One day, while riding along the river road, a song new to me and beautifully sweet and clear greeted my ear. Dismounting, I followed the sound into the forest. The clearness of the whistling song, the locality, and the careful concealment of the bird led me to feel sure of a species new to me. At the very first sight I fired. That song cost a fine male Black-crested Tit his life. Had I suspected him to have been the singer, I would gladly have spared the bird, as my bag was already filled.

63—♂ —5.75 x 9.00 x 2.87 x 2.63. Mar. 24, Brownsville.
209—♀ —5.75 x 9.00 x 2.75 x 2.50. Apr. 17, Hidalgo.
210—♂ —5.75 x 9.00 x 2.81 x 2.50. Apr. 17, Hidalgo.
213—♀ —5.63 x 8.75 x 2.75 x 2.50. Apr. 17, Hidalgo.
236—♀ —5.50 x 8.50 x 2.75 x 2.38. Apr. 19, Hidalgo.
238—♂ —5.50 x 9.00 x 2.87 x 2.62. Apr. 19, Hidalgo.
349—♀ juv.—5.50 x 8.50 x 2.37 x 2.12. May 3, Hidalgo.
350—♀ juv.—5.37 x 8.38 x 2.62 x 2.06. May 3, Hidalgo.
351—♀ juv.—5.38 x 8.62 x 2.50 x 2.05. May 3, Hidalgo.

AURIPARUS FLAVICEPS, (*Sund.*) *Bd.—Yellow-headed Titmouse.*

My first knowledge of the existence of this bird in the vicinity was the finding of a new nest on April 28th; but it contained no eggs, and was not recognized at the time. The next day I went to the nest, found one egg in it, and saw both parents. While the female was darting in and out of the thicket, evidently alarmed at my close proximity to her treasure, the male was flitting from tree to tree, on the topmost branches, singing as hard as he could. I watched them both for at least half an hour, when they disappeared.

Allowing five days to complete their complement of eggs, I again visited the nest. I cautiously approached and shook the bush, but no bird flew out of the nest. Thereupon I inserted my finger in the small opening on the side of the nest, and I could feel three eggs, and what I thought were some loose feathers. Imagine my surprise and fright upon withdrawing my finger at something flying out of the nest, directly into my face. It was the female. A few cries of alarm, and responses from her mate, and they were out of sight before I could reach my gun. Again carefully examining the nest, I very plainly felt four eggs. I wanted the birds as well as the eggs, and decided to leave them until another day, when I would secure all. Fatal mistake! for when it was next visited the female flew out of the nest before we reached it, was fired at, and missed. I, however, shot the male, and then went for the nest, but, lo! it was empty—not the least vestige of an egg! Nothing, in my opinion, could have removed the eggs but the bird itself. It was owing, in all probability, to the disturbance and fright of the previous visit. But why was she back in the nest? About this time three eggs were discovered in another nest, and when visited the day after they were also gone. We were very careful in examining lest we should disturb the eggs. Can it be possible that with the least touch the parent bird abandons her eggs? Two nests that we found had been torn open from above, evidently by some Jay or other robber. Out of the six new nests found between April 28 and May 10 we were only able to obtain one egg, and that was probably an infertile one, as the balance of the clutch had hatched and taken their departure. One nest was brought me on May 1 with three young about ready to leave. Their nests are simply wonderful, far excelling, to my mind, all other bird architecture of our fauna. Think of the size, varying from four to ten inches in diameter; then think of the size of the bird, but little larger than a Hummingbird! The shape is like a bottle, or, better still, a retort, with the mouth at one side and inclining downward. I found the nests built on and around one (in one instance two) horizontal branch. The body is composed of thorny twigs interwoven with wood-moss, grass, and bark. The lining is of the softest down and feathers, not loosely thrown in, but woven into a sort of matting, covering not only the whole of the interior body of the retort, or nest proper, but also the neck to the very mouth. The distance from the mouth to the eggs is sometimes six inches. The place selected is usually the extremity of a branch of an exposed bush, and easily approached. The highest nest was six feet, the lowest less than three feet from the ground. There they swing, free to every "norther", until they fall to pieces from decay. The only locality in which we found their nests was open chaparral, on that high ground where the cactus and a thorny, leafless bush, the junco, abound, and where are scattered at intervals clumps of trees of respectable growth, among which is the dark green ebony. The birds, though occasionally seen, are by no means abundant. The shape of the single egg secured is pointed at one end, rounded at the other, the greatest diameter being nearer one end. It is pale blue, speckled very thickly at the large end with reddish-brown, but sparsely elsewhere. It measures 0.63 by 0.44 of an inch.

376—♂—4.12 x 6.75 x 1.56 x 1.75. May 6, Hidalgo.
415—♂—4.62 x 6.75 x 2.05 x 2.00. May 10, Hidalgo.

TROGLODYTIDÆ.

THRYOTHORUS LUDOVICIANUS BERLANDIERI,* (*Couch*) *Cs.—Berlandier's Wren.*

Common on the Lower Rio Grande, frequenting uninhabited places near woodland, more especially the dead trees bordering the timber and lagoons. I found, however, one brood of young, just off the nest, in the dense woods near a bridle-path. I did not secure many specimens, for the reason that, at the time, I supposed them all *ludovicianus*. Had I suspected that they would prove to be *berlandieri*, I should have taken a larger number. Many were shot, but, as they showed no variation from those retained, and as I had many recognized rare birds to take care of, they were not preserved. My experience with the Wrens about Hidalgo is, that *bewicki* and this variety are the ones found breeding commonly. This bird breeds near the ground, seldom higher than five feet, in hollow trees, stubs, and even dead limbs lying on the ground. By the first of May, the young were about with the parents; at the same time perfectly fresh eggs were taken. Three sets of fresh eggs were secured, all from the same locality, where there seemed to be quite a colony of these birds breeding, many having families of young. Two of the sets were alike in color and markings. Of these, one (a set of five) was taken May 1st from an opening four feet from the ground, in a hollow tree, and given, less one egg, which was broken, to Dr. Merrill; the other (a set of four) was taken May 7th from a rotten tree lying on the ground, the nest being only two feet from the ground; this was given to Dr. Brewer. Dr. Brewer writes me in regard to his set, that "they differ from my four sets of *ludovicianus* in being smaller, in having ground-color clear white instead of pink, the spots larger and less numerous, but more distinct and more confined to the larger end than in *ludovicianus*. In fact, they are much more like *bewicki* than *ludovicianus*. The eggs measure 0.78 by 0.59, 0.75 by 0.59, 0.76 by 0.55, and 0.73 by 0.55."

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* [The specimens are rather puzzling, being intermediate between *ludovicianus* proper and the full development of *berlandieri*. Some of them, however, exhibit unmistakably he dark-barred flanks, longer bill, and other characters dwelt on by Baird in his diagnosis of *berlandieri*, to which form it may be proper to refer the whole lot, especially as Mr. Sennett's field observations do not indicate any differences among the larger Wrens of this locality.—E. C.]

The remaining set of six eggs was taken May 1 from the same locality. The bird was caught on her eggs, and considered just the same as all the others of the colony breeding there, and of which we had a number of adults and young. The eggs vary from the other two sets in the ground-color, in having more markings, and in having purple in with the brown. Their average size is 0.80 by 0.60. The ground-color is decidedly pinkish; the brown specks and blotches are distributed over the whole surface, but forming a thick band near the larger end. The nest of this set measures four inches outside diameter by two inches inside. It is composed of grasses, leaves, and a few stems, and lined with horsehair, a few feathers, and pieces of snakeskins. It was situated in a hollow, live tree, only three feet above the ground.

249—♂ —5.50 x 7.50 x 2.25 x 1.88. Apr. 20, Hidalgo.
312—♂ juv.—4.62 x 7.00 x 2.25 x 1.31. Apr. 30, Hidalgo.
313—♂ juv.—4.87 x 7.38 x 2.13 x 1.37. Apr. 30, Hidalgo.
329—♂ —6.00 x 8.00 x 2.25 x 2.13. May 2, Hidalgo.
330—♂ juv.—5.50 x 7.55 x 2.00 x 1.38. May 2, Hidalgo.

THRYOTHORUS BEWICKI, (*Aud.*) *Bp.—Bewick's Wren.*

This Wren is everywhere as common on the Southern border as is our House Wren in the North. I found them breeding in the woods, but rarely in the openings of the chaparral, among the cactus, in the thatched jacals of the towns, and most abundantly in the brush-fences. I did not find them as noisy as our House Wrens, but still lively and sweet songsters. Broods of full-grown young were about by the first of May. I can account for our not securing any eggs of this species by our being rather late in the season for their first laying, and also by their very domestic habits; and as we were collecting most of the time away from the settlements, we quite naturally neglected those birds near at hand. I saw none of var. *leucogaster* of this species, and no House Wrens, *Troglodytes aëdon.*

124—♂ —4.87 x 7.00 x 2.06 x 2.00. Mar. 31, Brownsville.
160—♂ —5.12 x 7.00 x 2.12 x 2.00. Apr. 5, Brownsville.
294—♂ —5.50 x 7.12 x 2.12 x 2.25. Apr. 28, Hidalgo.
302—♂ juv.—5.00 x 7.00 x 2.00 x 2.00. Apr. 29, Hidalgo.

ALAUDIDÆ.

EREMOPHILA ALPESTRIS CHRYSOLÆMA, (*Wagl.*) *Coues.—Southwestern Horned Lark.*

I first met this bird at Galveston, on the dry, sandy ridges adjoining the salt-marshes. It was in company oftentimes with *Plectrophanes maccowni*, McCown's Bunting. In the vicinity of Brownsville I frequently saw it along the roadside, in the small stretches of prairie a

On April 20th, soon after reaching Hidalgo, I was directed up the river some four miles by road, and there shot the first three specimens of this new species.

On May 3d, another was shot among the mezquite timber of the old resaca, within a mile of town. On May 8th, another was shot in a dense forest about half a mile from where the first three were obtained. Several more were seen; in fact, they were more abundant than any other Warbler. It was a constant surprise to me while on the Rio Grande that so few Warblers were to be seen. I had depended on getting a large number of species, and was constantly on the lookout for them, daily frequenting places where I expected to find them.

All of the specimens obtained are males, and I remember of seeing none in pairs. They were seen usually in little groups of three or four. They are by no means shy, but frequenting, as they do, the woods, cannot be readily seen. Dr. Merrill writes me from Fort Brown that in July he found the nest and three young of what he supposed at the time to be *Parula americana*, but which may prove to belong to this species. I have little doubt that another season will bring to our knowledge full accounts of the breeding habits of this beautiful new Warbler.

I have just received from Dr. Merrill, Fort Brown, a description of the nest found in July:—

"My nest of *Parula* was taken July 5th, about five miles from here. It was placed in a small thin bunch of hanging moss, about ten feet from the ground, in a thicket; was simply hollowed out of the moss, of which it was entirely composed, with the exception of three or four horse-hairs; entrance on side; contained three young about half-fledged. Parents very bold, but thinking they were *americana* I did not shoot them."

248—♂—4.37 x 6.75 x 2.25 x 1.68. Apr. 20, Hidalgo.
250—♂—4.25 x 6.75 x 2.13 x 1.56. Apr. 20, Hidalgo.
252—♂—4.25 x 6.75 x 2.12 x 1.63. Apr. 20, Hidalgo.
343—♂—4.25 x 6.50 x 2.00 x 1.62. May 3, Hidalgo.
396—♂—4.50 x 7.00 x 2.00 x 1.87. May 8, Hidalgo.

HELMINTHOPHAGA RUFICAPILLA, (*Wils.*) *Bd.—Nashville Warbler.*

The only specimen seen was in the dense woods in the vicinity of Hidalgo.

395—♂—4.50 x 6.87 x 2.00 x 1.63. May 8, Hidalgo.

HELMINTHOPHAGA CELATA, (*Say*) *Bd.—Orange-crowned Warbler.*

Only one specimen shot, and we were unable to save it on account of the great heat. Measurements taken and sex examined. The bird was shot in undergrowth, near a lagoon.

110—♂—4.75 x 7.50 x 2.50 x 2.12. Mar. 29, Brownsville.

DENDRŒCA VIRENS, (*Gm.*) *Bd.—Black-throated Green Warbler.*

Shot in vicinity of Hidalgo while we were riding along the road through the woods. It is in very fine plumage.

251—♂—5.00 x 7.75 x 2.63 x 2.12. Apr. 20, Hidalgo.

DENDRŒCA CORONATA, (*L.*) *Gr.*—*Yellow-rumped Warbler.*

On the northern end of Padre Island, in the middle of March, I saw more of the migration of our northern birds than during the remainder of my stay in Texas, although I was on the island but three or four days. All of the respectable growth of vegetation upon the island consisted of a few bushes and small trees, in which was located the camp of the Coast Survey. Conspicuous among the birds seen at this time was the Yellow-rumped Warbler. I saw a few also about Brownsville up to about April 15. I am told that some remain all summer on the southern border, but I saw no signs of it.

DENDRŒCA DOMINICA ALBILORA, (*L.*) *Ridgw.*—*Yellow-throated Warbler.*

This specimen has the entire superciliary line white.[*] The only one seen; shot in the open chaparral among mezquite and cactus.

84—♂—5.37 x 8.50 x 2.75 x 2.00 Mar. 26, Brownsville.

SIURUS MOTACILLA,[†] (*V.*) *Bp.*—*Large-billed Water Thrush.*

Shot near Brownsville in a mezquite grove on the border of a lagoon, some fifty feet from the water's edge. It was seen flitting through the branches near the ground, and never at rest. This is the only one recognized, and, as I was often in favorable places for them, I cannot think them abundant.

119—♀—6.00 x 10.00 x 3.00 x 2.00. Mar. 31, Brownsville.

ICTERIA VIRENS, (*L.*) *Bd.*—*Yellow-breasted Chat.*

This bird is quite common in suitable places, although, as everywhere else, more frequently heard than seen. Its first choice is a thick brush-fence. At Brownsville, we were quite surprised to have a bird-woman offer us a pair in a cage, and I bargained with her to keep them for us until our return from up the river, but we never heard from them again.

At Hidalgo, nearly every night, when through our work, we went to the river to bathe, and never did we fail to hear the sweet melody of the Chats, in a thicket and brush-fence across the river. No matter at what time we might wake on a still night we could hear "our Chats", as we familiarly called them. I think them by far the finest singers of all our birds. I did not come upon their nests. I am indebted to Dr. Merrill for a set of four eggs and nest, taken near Brownsville while I was up the river. The nest is composed of weeds and a few leaves laid around in layers, and lined with a few rootlets. Outside, it is 4½ inches in diameter by 2½ deep; inside, 2½ diameter by 2 inches deep. The eggs are white, speckled thickly at the larger end and sparsely at the smaller with reddish-brown. Largest egg of the four, 0.92 by 0.71; smallest, 0.85 by 0.69; average size, 0.89 by 0.70.

182—♂—7.12 x 9.75 x 3.13 x 3.12. Apr. 8, Brownsville.
280—♂—8.00 x 10.25 x 3.13 x 3.50. Apr. 26, Hidalgo.

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[*] [Typically representing Mr. Ridgway's subspecies, which seems to prevail, if it be not the only form, in the Mississippi Basin and Texas.—E. C.]

[†] [See my "Corrections of Nomenclature in the Genus *Siurus*". <Bull. Nuttall Club, ii. 1877, 33.—E. C.]

SETOPHAGA RUTICILLA, (*L.*) *Sw.*—*Redstart.*

I saw several of this species in the latter part of April at Hidalgo, and shot one female. They frequented the undergrowth of heavy timber on the very bank of the river.

TANAGRIDÆ.

PYRANGA ÆSTIVA, (*L.*) *V.*—*Summer Redbird.*

The first I saw of this bird was on April 20 in heavy timber in the vicinity of Hidalgo. Here we met the first tall growth of trees, these attaining a height of fifty or sixty feet, and free enough from undergrowth to admit of riding through on horseback. Here two males of this species were shot, and one female seen. They did not seem to be paired at that time. I afterward saw them frequently in the dense woods, but never in the open chaparral. They were generally seen on the undergrowth or among the lower limbs of the larger trees. I did not find them very shy. On May 7, my companion flushed a bird of this species from its nest, in which there was one egg. He left the nest to consult me, in another part of the woods, whether to leave it for more eggs or take it as it was. We decided to take it, as we were then expecting the boat any day to take us to Brownsville, and the chances of reaching that locality again were very doubtful. On his going back, although not half an hour had elapsed since his first visit, the nest was empty. The nest was built on a very small tree in the heart of the woods, and was only five and one-half feet from the ground on a horizontal fork, on which several twigs stood upright, serving as a sort of basket to hold it. The body of the nest was composed of Spanish moss and small pliant twigs woven about the living branches. The lining was made entirely of soft, bleached grasses, and is plainly seen through the moss from below. Outside diameter was 5 inches by 4¼, and depth of 2¾; inside diameter 2½ inches, and 1¾ deep, with the rim drawn in slightly.

253—♂—7.75 x 12.00 x 3.75 x 3.00. Apr. 20, Hidalgo.
255—♂—8.00 x 12.00 x 4.00 x 3.25. Apr. 20, Hidalgo.
266—♂—7.75 x 12.00 x 3.75 x 3.25. Apr. 24, Hidalgo.
267—♀—7.75 x 12.00 x 3.75 x 3.25. Apr. 24, Hidalgo.
304—♂—8.00 x 12.25 x 3.87 x 3.25. Apr. 30, Hidalgo.
342—♂—8.25 x 12.75 x 3.87 x 3.12. May 3, Hidalgo.
387—♂—7.62 x 12.25 x 3.75 x 3.12. May 7, Hidalgo.

HIRUNDINIDÆ.

HIRUNDO HORREORUM, *Barton.*—*Barn Swallow.*

Not noticed on the Rio Grande; but on May 22d, when our steamer was about opposite Galveston, several of this species flew about us, almost in our faces, sometimes alighting on the deck. They kept us company for hours.

TACHYCINETA BICOLOR, (*V.*) *Coues.*—*White-bellied Swallow.*

Numbers were seen on our way down the coast from Indianola to Point Isabel. They were also seen about the lagoons in the vicinity of Brownsville up to about April 1st, after which time none were observed.

PETROCHELIDON LUNIFRONS, (*Say*) *Cab.*—*Cliff Swallow.*

None were seen lower down the river than Hidalgo, much to our wonder, for the conditions seem quite as favorable for them at Brownsville or Matamoras as at points above. In the absence of cliffs in the vicinity of Hidalgo, they adapt themselves to the eaves of the buildings in the town. Through the kindness of Sheriff Leo we occupied the court-house, and these Swallows were incessantly working and chattering about us from daylight until dark, and even in the night we could hear them in their nests. We had ample opportunity to observe their habits. They are gregarious in all their occupations. In collecting mud for their houses, the choice spots of their selection on the margin of the river are so thickly covered with them that often more than a hundred will be huddled on and over a space of two feet in diameter. The curious bottle-shaped nests were crowded so thickly together that little could be seen of them but their mouths. We endeavored to obtain a sample of the nests entire; but there was so much quicksand in the mud of which they were made that we found it impracticable to do so. None of the nests were lined. In some we found stones and bits of broken crockery, which had been thrown in by the boys before the nests were completed; and yet the birds had laid their eggs among the rubbish. In making the nest, the first choice is a corner formed by wall, eaves, and rafter, very little labor, therefore, being necessary to make the remaining side. This side or nest is made spherical, with the mouth and neck standing out some two inches from it. The next ones lap on to it, others lap on to them, and so on. As soon as a shelf is formed large enough to hold the bird, it stands on it and works from within. The pair work in turn. To gather the eggs it is necessary to demolish a part of the nest, unless, as we sometimes found, eggs were laid before the nest was finished. In the completed nests, the clutch varied from four to seven; but in one extra large nest, which from its size and shape looked as if two birds occupied it in common, we took ten eggs. From the window of our sleeping-room we could watch the birds at their work without disturbing them, although but four feet distant from some of them. When we took the eggs, on May 7th, some were nearly ready to hatch, but most of them were fresh, and many birds were just beginning their nests.

The ground-color of the eggs is a dull white. The markings are brown and very variable. Some are speckled, others blotched; some regularly over the whole egg, and others with far the greater number of spots on the larger end. The longest egg was 0.90, the shortest 0.70; the broadest 0.60, and the narrowest 0.53. The average of fifty eggs is 0.80 by 0.56.

389—♀—5.75 x 11.50 x 4.12 x 1.88. May 7, Hidalgo.

AMPELIDÆ.

AMPELIS CEDRORUM, (*V.*) *Bd.—Cedar-bird.*

At Lomita Ranche, some seven miles above Hidalgo, I was surprised to see a flock of birds alight in the top of a large tree over my head. It was rare, indeed, to see a flock of land birds other than Blackbirds, and even they, at that time of year, were scattered in pairs and busy with nests and eggs. Upon firing I was still further surprised to pick up our own familiar Cherry-bird. The day was hot, being about 100° Fahrenheit in the shade. I have shot the same bird at home when the thermometer indicated 12° below zero. These birds were in full plumage, and were the only ones seen.

400—♂—7.37 x 12.00 x 3.75 x 2.37. May 8, Hidalgo.

VIREONIDÆ.

VIREO OLIVACEUS, (*L.*) *V.—Red-eyed Vireo.*

Shot by the roadside in the woods. The only one secured. The eggs were well developed.

307—♀—6.12 x 9.75 x 3.00 x 2.00. Apr. 30, Hidalgo.

VIREO NOVEBORACENSIS, (*Gm.*) *Bp.—White-eyed Vireo.*

Two birds of this species were shot in open chaparral, and were probably migrating. We noticed none after March 27.

85—♂—5.00 x 7.50 x 2.50 x 2.00. Mar. 26, Brownsville.
91—♀—5.00 x 7.38 x 2.25 x 2.00. Mar. 27, Brownsville.

VIREO BELLI, *Aud.—Bell's Vireo.*

This single specimen was shot seven miles from Hidalgo, in a small bush under an ebony-tree. Of its habits I saw nothing.

394—♂—5.25 x 7.25 x 2.12 x 1.88. May 8, Hidalgo.

LANIDÆ.

COLLURIO LUDOVICIANUS EXCUBITORIDES, (*L.*) *Bd.—Loggerhead Shrike.*

This variety was quite common in open places, but very shy. It was rarely seen in the dense chaparral or wooded districts, preferring the openings near towns and ranches or the prairies.

198—♂—9.00 x 12.50 x 3.88 x 3.88. Apr. 9, Brownsville.

FRINGILLIDÆ.

RHYNCHOPHANES* MACCOWNI, (*Lawr.*) *Bd.—McCown's Bunting.*

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* [Baird, in 1858, it will be remembered, noted the non-agreement of the species with the characters of *Plectrophanes* proper, and made a new subgenus, *Rhynchophanes*, for its accommodation. I have lately found a prior notice to the same effect. Bonaparte had said in 1857, in his "Observations sur Diverses Espèces d'Emberiziens", etc., Rev. et Mag. de Zool. ix. 1857, 161:—"Mais ce que nous n'avons pas dit encore, et que nous proclamons ici, c'est que le prétendu *Plectrophanes maccowni* Lawrence, Ann. Lyc. N.-York, V, p. 122, du Texas oriental, n'est pas de celle Sous-famille, mais un Loxien du groupe des Montifringilles, très-voisin de *Rhodopechys phœnicoptera*."—E. C.]

I found these only about Galveston. They were in large flocks, and associated with them were *Eremophila chrysolæma*, Southwestern Skylark, and *Neocorys spraguii*, Missouri Skylark. They frequented the sandy ridges adjoining the salt-marshes. In habits they reminded me of *P. lapponicus*, Lapland Longspur, as I saw them in Minnesota last year. When flushed, they dart from side to side, taking a swift, irregular course, never very high, and suddenly drop down among the grass-tussocks, with their heads toward you. They are so quiet and so much the color of their surroundings that they are seen with difficulty. They fly in such scattered flocks that a single discharge of the gun can seldom bring down more than one or two. That they extend farther south than the vicinity of Galveston I very much doubt, for we would, in all probability, have noticed them if they had been farther down the coast.

1—♂—6.37 x 11.25 x 3.50 x 2.25. Feb. 28, Galveston.
2—♀—5.75 x 10.75 x 3.13 x 1.87. Feb. 28, Galveston.
3—♂—6.37 x 11.62 x 3.50 x 2.20. Feb. 28, Galveston.

PASSERCULUS SAVANNA, (*Wils.*) *Bp.—Savanna Sparrow.*

The several specimens secured were found on or near the ground, and mostly in old *resaca* beds, where tall grass abounds. I found none at all at Hidalgo, probably owing to the higher ground, distance from the coast, and few openings.

29—♂—5.50 x 9.25 x 2.75 x 2.00. Mar. 9, Brownsville.
66—♀—5.25 x 8.25 x 2.62 x 2.00. Mar. 24, Brownsville.
72—♂—5.60 x 9.25 x 2.75 x 2.00. Mar. 25, Brownsville.
109—♂—5.50 x 8.75 x 2.75 x 2.10. Mar. 29, Brownsville.
171—♂—5.50 x 9.25 x 2.75 x 2.10. Apr. 7, Brownsville.
187—♂—5.75 x 9.00 x 2.75 x 2.10. Apr. 9, Brownsville.

POŒCETES GRAMINEUS CONFINIS, (*Gm.*) *Bd.—Western Grass Finch.*

Both of the specimens secured were shot in low bushes; one by the side of the road, and the other in the openings of the chaparral, among the cactus. From the nature of the country, all of the ground birds are extremely difficult to study or even shoot. The great abundance of impenetrable thickets give them convenient and safe cover at all times. I will say here that during the whole trip not a single nest of the numerous small birds was found on the ground or in a low bush. It is worse by far than collecting on the Western prairies, for here one cannot even ride over or step near the nests to expose the eggs by flushing the bird.

185—♂—6.60 x 10.90 x 3.35 x 2.75. Apr. 9, Brownsville.
301—♀—6.25 x 10.50 x 3.10 x 2.50. Apr. 29, Hidalgo.

AMMODROMUS MARITIMUS, (*Wils.*) *Sw.—Seaside Finch.*

We did very little shore collecting, owing to frequent changes of locality and inconveniences for preserving. Galveston was the only point where I shot this species; none, however, were prepared. I have no doubt that this bird, as well as *A. caudacutus*, Sharp-tailed Finch, resides the year round on the whole of the Texas coast.

MELOSPIZA LINCOLNI, (*Aud.*) *Bd.—Lincoln's Finch.*

This bird was seen in small flocks about the low bushes in exposed places in the vicinity of Brownsville. Farther up the river I did not notice any. They were full of song, and rather shy, darting into the bushes at my approach.

136—♂—6.00 x 8.10 x 2.50 x 2.00. Apr. 2, Brownsville.
146—♂—5.75 x 8.00 x 2.40 x 2 25. Apr. 3, Brownsville.
211—♂—5.60 x 8.40 x 2.50 x 2.25. Apr. 17, Brownsville.
212—♂—5.85 x 8.40 x 2.50 x 2.50. Apr. 17, Brownsville.

PEUCÆA CASSINI,* (*Woodh.*) *Bd.—Cassin's Finch.*

This shy Finch is quite common about Brownsville early in the season. Its colors render it almost invisible while at rest. At the first sight of man, it darts into the thickest of bushes, and is with difficulty frightened out. It is a sweet singer, and, when undisturbed, is usually perched on the topmost branches of low bushes. Its song, although not loud, is quite distinct from that of other birds, and once heard cannot be mistaken. I did not meet with it above Brownsville.

188—♂—6.25 x 8.50 x 2.60 x 2.60. Apr. 9, Brownsville.
189—♂—6.25 x 8.25 x 2.55 x 2.50. Apr. 9, Brownsville.

AMPHISPIZA BILINEATA, (*Cass.*) *Coues.—Black-throated Finch.*

These beautiful little birds, almost as restless as the Titmice, were found in all suitable localities on the Rio Grande. At the time I saw them they were always in pairs, and not at all shy, and I enjoyed watching them exceedingly. I refrained from shooting many, with a view to finding their eggs. Every few days I would visit certain localities, where I never failed to find the birds, but was quite unsuccessful in finding their nests.

There is a bush on the Rio Grande, whose name I could not learn, common in exposed and dry places, usually on barren knolls bordering the resacas, whose scanty leaves are so small that it at all times presents a dull and lifeless appearance. It is this bush that the Black-throated Finches like to frequent. The male will sit on the top of a bush, four or five feet from the ground, and sing to his mate by the hour, she meanwhile flitting from bush to bush, as if her nest was near, though in no way manifesting any alarm. On the 6th of May I shot a nearly full-grown young, this showing that they begin to lay very early.

122—♂ —5.40 x 8.25 x 2.50 x 2.35. Mar. 31, Brownsville.
123—♀ —5.35 x 8.00 x 2.35 x 2.25. Mar. 31, Brownsville.
292—♂ —5.60 x 8.25 x 2.50 x 2.35. Apr. 28, Hidalgo.
298—♂ —5.50 x 8.25 x 2.50 x 2.25. Apr. 29, Hidalgo.
381—♂ juv.—5.10 x 8.00 x 2.50 x 2.00. May 6, Hidalgo.

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* [Important specimens, illustrating this good species in its purity. See the correction of the error I committed in the "Key", in Birds of the Northwest, p. 140.—E. C.]

SPIZELLA SOCIALIS, (*Wils.*) *Bp.—Chipping Sparrow.*

3.25—♂—5.25 x 9.25 x 2.75 x 2.50. May 1, Hidalgo.
3.63—♀—5.35 x 8.50 x 2.65 x 2.30. May 4, Hidalgo.

SPIZELLA PALLIDA, (*Sw.*) *Bp.—Clay-colored Sparrow.*

The single specimen was shot in a low bush just outside of the village of Hidalgo. Nothing whatever noticed of its habits.

290—♀—5.75 x 8 x 2.25 x 2.50. Apr. 28, Hidalgo.

ZONOTRICHIA LEUCOPHRYS, (*Forst.*) *Sw.—White-crowned Sparrow.*

These birds were all in poor plumage, as they were undergoing their spring moult. They were abundant about hedges, fences, and thickets, in company with *C. grammica*, Lark Finch. I did not take any var. *intermedia*, which takes the place of this species when it leaves for the North. I presume I could have obtained them before I left if I had not been occupied with other birds.

82—♀—6.25 x 9.65 x 3.0 x 2.75. Mar. 26, Brownsville.
127—♀—8.00 x 9.75 x 3.0 x 3.00. Mar. 31, Brownsville.
128—♀—7.00 x 9.75 x 3.0 x 2.75. Mar. 31, Brownsville.
137—♀—7.25 x 10.00 x 3.1 x 2.75. Apr. 2, Brownsville.

CHONDESTES GRAMMICA,* (*Say*) *Bp.—Lark Finch.*

I found this bird very common about Brownsville, but quite scarce farther up the river. Generally seen about brush-fences and in meadows with scattered clumps of trees; sometimes in broken flocks, and again apparently in pairs. My first one was shot on the ground, where it seemed to be feeding alone. I frequently came upon companies of them on the ground. They were often seen in company with *Z. leucophrys*, White-crowned Sparrow. A large number of birds was taken, but only a few measured.

90—♂—6.50 x 11.00 x 3.50 x 2.75. Mar. 27, Brownsville.
132—♂—6.85 x 11.25 x 3.75 x 2.75. Apr. 2, Brownsville.

EUSPIZA AMERICANA, (*Gm.*) *Bp.—Black-throated Bunting.*

These two birds were the only ones we happened to meet with, and they were shot in open woodland, in company with Blue Grosbeaks and Orioles.

314—♀—6.00 x 9.75 x 3 x 2.25. Apr. 30, Hidalgo.
378—♀—6.00 x 9.50 x 3 x 2.12. May 6, Hidalgo.

GONIAPHEA CŒRULEA, (*L.*).—*Blue Grosbeak.*

Not very abundant, yet breeding all along the Lower Rio Grande. At Hidalgo, a pair was noticed continually about the river-bank. We were careful not to shoot them, and the citizens joined us in trying to

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*[*Sic grammica.* I see no authority for the current form, "grammaca".—E. C.]

find their nest. One day, by accident, I discovered it. About May 1st, several of us were coming along the beaten path from the ferry. I turned aside to take a short cut through the weeds, which grew nearly as tall as my head. Not more than ten feet from the path I came upon a partly overturned nest, containing four young. Their pin-feathers, though just started, showed deep blue on the wings. The nest was about four and one-half feet from the ground, and composed of grasses twined around the weed-stalks, after the manner of Blackbirds' building. It was by no means firmly built nor tightly bound to the stalks, and some cattle had evidently nearly tipped the little household out. I righted the nest, bound it to a fresh stalk or two, and left it. All the time we were examining and working at the nest, the parents were sitting on a woodpile close by, showing no alarm whatever.

281—♂—7.75 x 12.25 x 4.00 x 3.10. Apr. 26, Hidalgo.
303—♂—7.25 x 11.25 x 3.50 x 2.85. Apr. 29, Hidalgo.
327—♂—7.50 x 12.00 x 3.50 x 2.85. May 2, Hidalgo.
345—♂—7.25 x 11.65 x 3.50 x 3.00. May 3, Hidalgo.

CYANOSPIZA CIRIS, (*L.*) *Bd.—Painted Finch.*

April 25th, at Hidalgo, was the first we saw of this beautiful bird, after which we saw one or two daily. They were extremely shy. The specimen obtained is remarkable, having every outward appearance of being a female, and yet being a male, with fully developed testicles. Two of us examined it with great care, and deliberated over the case; therefore, there is no chance of a mistake.*

362—♂—5.50 x 9.00 x 2.75 x 2.40. May 4, Hidalgo.

CYANOSPIZA VERSICOLOR, (*Bp.*) *Bd.—Western Nonpareil.*

I did not obtain any specimens of this bird, but I saw and compared two fine males† shot by Dr. Merrill near Brownsville while I was up the river.

CYANOSPIZA CYANEA, (*L.*) *Bd.—Indigo-bird.*

I have to note seeing a number of these beautiful and familiar birds on the Rio Grande, at a ranche, when our boat stopped for wood on April 15th. While the crew were cutting the wood, I improved the delay by taking the gun and sauntering about. I must have seen at least a dozen of these birds, of both sexes. They persisted in either staying on the farther side of an impenetrable brush-fence or else out in the thicket over a swamp. To shoot them in either case would have been unprofitable, for I could not have recovered the birds. They were singing very sweetly, and were the only ones I met during the trip.

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* [The plumage is absolutely that of the mature female, to which sex any ornithologist would refer the specimen without hesitation but for the author's positive testimony to the contrary.—E. C.]

† See Bulletin of the Nuttall Ornithological Club, ii. n. 4, 109, Oct. 1877.

PYRRHULOXIA SINUATA, *Bp.*—*Texas Cardinal.*

In the close vicinity of Brownsville, I found these birds quite abundant. I first met them while after some Cowbirds, *Molothrus æneus*, in a brush-fence, near the Catholic cemetery, and shot two females. One day, by following up the fences just without the city, one on each side, we obtained eleven, and out of the lot only one was a male. At Hidalgo, we met occasionally solitary pairs in the thickets away from habitations. Their habits I found to be much like those of the Cardinal Redbird, only they keep closer to the ground. We searched everywhere for their nests, but with no success. Out of over twenty specimens secured, there were only three males. I several times heard the whistle of the male, and I could readily distinguish it from the note of *cardinalis*. I found this species very shy; and when surprised, instead of flying boldly off to another bush, it would invariably dart toward the ground, and fly along the brush, behind some projection, or through the fence to the opposite side, so that a shot on the wing was out of the question. Their skins are extremely tender, and their skulls are expanded, so that great care must be observed in skinning, or ugly rents will be the result. That they breed along the Lower Rio Grande, there can be no doubt, and we may expect before long full accounts of their breeding habits.

120—♀—8.00 x 11.00 x 3.50 x 4.00. Mar. 31, Brownsville.
121—♀—8.25 x 11.50 x 3.50 x 4.00. Mar. 31, Brownsville.
158—♂—8.50 x 11.75 x 3.75 x 4.00. Apr. 5, Brownsville.
159—♀—8.25 x 11.50 x 3.50 x 3.75. Apr. 5, Brownsville.
235—♂—8.50 x 11.50 x 3.65 x 3.85. Apr. 19, Hidalgo.
289—♂—8.50 x 11.75 x 3.50 x 3.85. Apr. 28, Hidalgo.
360—♀—8.25 x 11.00 x 3.40 x 4.00. May 4, Hidalgo.

CARDINALIS VIRGINIANUS, (*Brisson*) *Bp.*—*Cardinal Redbird.*

The habits of this familiar bird are too well known, both in the gardens of the South and in captivity, to need any further notice. So far, however, from finding them as tame on the Rio Grande as they are represented to be elsewhere, the reverse is true. We found them quite common, yet very shy. A number of nests and sets of eggs were obtained. They were generally taken in dense thickets, some five feet from the ground; but we found one nest and two eggs, seven feet from the ground, in a bushy tree; and another, only two and one-half feet from the ground, in a thicket. First nest and three fresh eggs found April 28th. Their nests vary greatly, according to location; some are bulky, and others hardly more than would answer for a Carolina Dove. Spanish moss enters largely into the outside, together with twigs and leaves. The lining is composed of rootlets and pliant twigs, and sometimes grasses also. The eggs are dull white, blotched and speckled all over, but more heavily at the larger end, with brown; generally the spots are lengthened, which gives the eggs the appearance of being streaked.

The largest egg was 1.02 by 0.72; the smallest, 0.94 by 0.72; average size, 0.96 by 0.72.

74—♂—8.15 x 11.25 x 3.50 x 3.50. Mar. 25, Brownsville.
92—♂—8.25 x 11.50 x 3.65 x 4.00. Mar. 27, Brownsville.
164—♂—8.00 x 11.75 x 3.60 x 4.00. Apr. 6, Brownsville.
192—♂—8.75 x 11.40 x 3.60 x 4.00. Apr. 9, Brownsville.
218—♀—8.25 x 11.25 x 3.40 x 3.75. Apr. 17, Hidalgo.
232—♂—8.00 x 11.00 x 3.50 x 4.00. Apr. 19, Hidalgo.
237—♂—8.75 x 11.00 x 3.60 x 4.00. Apr. 19, Hidalgo.
359—♂—9.00 x 11.50 x 3.50 x 4.25. May 4, Hidalgo.
364—♀—8.00 x 10.75 x 3.25 x 3.75. May 4, Hidalgo.

EMBERNAGRA RUFIVIRGATA, *Lawr.—Green Finch.*

I met this bird frequently, both in the vicinity of Brownsville and Hidalgo. It would take a long time to become well acquainted with the habits of this species, on account of its color being so little distinguishable from the shade of the thickets which it frequents. I do not consider it shy. I have several times been obliged to retreat before shooting, to save the bird from being blown to pieces. On May 5th, I spent two or three hours watching a Green Finch carrying grasses in its beak, but my patience was unrewarded with the sight of its nest. In addition to the two nests found last year,[*] Dr. Merrill writes me of finding others since I left. This demonstrates that they raise at least two broods within our limits, one in May and June, the other in August and September.

138—♂—6.50 x 8.50 x 2.40 x 2.50. Apr. 2, Brownsville.
165—♂—6.50 x 9.00 x 2.75 x 2.60. Apr. 6, Brownsville.
328—♂—6.75 x 9.00 x 2.50 x 2.60. May 2, Hidalgo.
377—♂—6.15 x 8.50 x 2.60 x 2.50. May 6, Hidalgo.
414—♂—6.50 x 8.75 x 2.60 x 2.75. May 10, Hidalgo.
417—♀—6.00 x 8.75 x 2.45 x 2.50. May 11, Hidalgo.

ICTERIDÆ.

MOLOTHRUS ATER OBSCURUS, (*Gm.*) *Coues.*[†]—*Dwarf Cowbird.*

This bird made its appearance in force at Brownsville about April 1st, falling in at once with *M. pecoris* and the troops of other Blackbirds. By the first of May, all of *M. pecoris* had gone north, and the Dwarf variety was abundant everywhere in its place. At the stable where I was in the habit of going for horses, they fairly swarmed, coming in at the open doorways with *Quiscalus macrurus*, Great-tailed Grackle, *Scolecophagus cyanocephalus*, Blue-headed Grackle, and *Molothrus æneus*, Red-eyed Cowbird. The Dwarf Cowbird was conspicuous among them all, hopping on, under, and all about the horses after food. It is marked exactly like *M. pecoris*, but is very perceptibly smaller. Its habits are in every respect the same. I found one egg in a nest of *Icterus bullocki*, Bullock's Oriole, and another in a nest of *Icterus cucullatus*, Hooded

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[*] See Bulletin of Nuttall Orn. Club, i. 89, Nov. 1876.

[†] *Cf.* Birds of the Northwest, 1874, 180.

Oriole. The eggs resemble those of *M. pecoris*, but are not so heavily speckled, and are smaller. Color dull white, with the faintest tinge of blue, and finely speckled with light brown, much more thickly at the larger end. The size of the largest egg is 0.80 by 0.60, the only one retained.

MOLOTHRUS ÆNEUS, (*Wagl.*) *Cab.*—*Bronzed or Red-eyed Cowbird.*

[*Icterus aeneus*, Licht. "Mus. Berol."

Psarocolius aeneus, Wagler, Isis, 1829, 758.—Bp. C. A. i. 1850, 426.

Agelaius æneus, Gray, "Gen. of B. ii. 184–, 346".

Molothrus aeneus, Cab. Mus. Hein. i. 1851, 192.—Scl. "P. Z. S. 1856, 300; 1859, 365, 381".—S. & S. "Ibis, 1860, 34".—Scl. Cat. 1862, 135 (Mexico).—Giebel, Nomencl. Av. 1875, 609.—Lawr. Bull. Nat. Mus. n. 4, 1876, 24 (Tehuantepec).—Merrill, Bull. Nuttall Club, i. 1876, 88 (introduced to U. S. fauna; Fort Brown, Texas; abundant).—Merrill, *ibid.* ii. 1877, 85 (habits).

Molothrus (*Callothrus*) *æneus*, Cass. Pr. Phila. Acad. 1866, 18 (critical).—Gray, Handlist, ii. 1870, 37, n. 6509.

Molothrus robustus, Cab. Mus. Hein. 1851, 193; "J. f. O. 1861, 81".

HAB.—Mexico and Central America. Guatemala. Veragua. Costa Rica. Yucatan. North to the Rio Grande of Texas.

♂ *ad. corpore toto cum capite æneo-atris, unicoloribus, alis caudâque nigris, viridi-violaceo-purpuratis. Long. tot.* 8¼; *alæ* 4¾; *caudæ* 3¼. ♀ *ad. minor, obscurior, ex toto niger, nec brunneus, sed vix nitens. Long. alæ* 4⅛; *caudæ* 2⅞.

♂, adult: Entire body and head uniform black, splendidly lustrous with bronzy reflections, the tint very much like that of the back of *Quiscalus purpureus* var. *æneus*. This rich brassy-black is perfectly uniform over the whole bird, there being no distinction of color between the head and body, so conspicuous in *M. ater*. Wings and tail black, with violet, purple, and especially green metallic lustre on the upper surfaces. Under wing- and tail-coverts chiefly violaceous-black; the purplish and violaceous tints are also most noticeable on the upper coverts of both wings and tail, the reflections of the quill-feathers themselves being chiefly green. Bill ebony-black. Feet black. "Iris red." Length 8–8½; extent about 11; wing 4½–4¾; tail 2¾–3½; bill $\frac{9}{10}$ along culmen, very stout and especially deep at the base, much compressed, the lateral outline concave, the under outline perfectly straight, the upper gently convex throughout, the tip very acute.

♀ notably smaller than the male; the wing scarcely over 4 inches, the tail under 3; culmen scarcely ¾. Color not brown, as in *M. ater* ♀, but uniformly quite black, with considerable gloss, though nothing like the brassy splendor of the male. Wings and tail with greenish reflections.

Young ♂: I have seen no very young birds. Early spring birds, in imperfect dress, are exactly like the adult ♀ in color, but much larger.

This beautiful species of *Molothrus* cannot be confounded with the Common Cowbird. It much more nearly resembles *Scolecophagus cyanocephalus*, being of nearly or about the same size, and in fact might not be distinguished at first sight when flying about, unless in perfect dress, when the brassy lustre is conspicuous. The iris is red, that of Brewer's Blackbird being yellow, and the bill is much stouter. There is no distinction whatever in color between the head and body, and the bronzy tint is much that of some varieties of the Purple Grackle, contrasting strongly with the violaceous-green wings and tail. The bronzing is only on the ends of the feathers, the covered parts of which are violaceous-black, with plain dusky roots. In the breeding season, the males are said to present a peculiar puffy appearance of the fore parts, and some fullness of the plumage of these parts is recognizable in the prepared skins. The description is taken from specimens from Fort Brown, Texas.—E. C.]

This fine large Cowbird, so recently added to our fauna, is very abundant all along the Lower Rio Grande, and is easily distinguishable from the other members of the genus. The only Blackbird for which it could be mistaken at gunshot range, and with which it is intimately associated up to about May 1st, is *Scolecophagus cyanocephalus*, Blue-headed Grackle. In full plumage they are not so much alike as when immature. The iris of *M. æneus* is bright red, and can, upon acquaintance, be readily distinguished from the bright lemon iris of *S. cyanocephalus* at quite a distance. They breed later than most of the family, and in habits are very similar to *M. ater*, our Common Cowbird. They had only commenced to lay when I left. For a very complete account of their breeding habits I refer to an article by Dr. James C. Merrill, in the Bulletin of the Nuttall Ornithological Club, ii. n. 4, 85, October, 1877.

115—♂—8.50 x 15.00 x 4.65 x 3.25. Mar. 30, Brownsville.
116—♂—8.25 x 15.00 x 4.75 x 3.50. Mar. 30, Brownsville.
126—♂—9.00 x 15.25 x 4.65 x 3.25. Mar. 31, Brownsville.
361—♂—8.75 x 15.00 x 4.75 x 3.25. May 4, Hidalgo.
372—♂—9.00 x 14.75 x 4.40 x 3.00. May 5, Hidalgo.

AGELÆUS PHŒNICEUS, (*L.*) *V.—Red-winged Blackbird.*

I found this species breeding in great numbers along the Lower Rio Grande. They usually build their nests low, among the rank growth of weeds and willows that spring up in the resaca beds after the annual overflows of the river. One nest, however, I found at least twenty feet high in a mezquite-tree. It was composed of bleached grasses and attached to a leaning branch; was partly pensile, and looked like a large nest of the Orchard Oriole, *Icterus spurius*. I was deceived into climbing for it. Hundreds of eggs were examined, and the only difference I could see from those of the North was in size, the Southern eggs being smaller. In a large series of eggs taken, the longest was 0.99 of an inch and the shortest 0.80; the broadest 0.72 and the narrowest 0.63. The average length is 0.91 and breadth 0.67.

XANTHOCEPHALUS ICTEROCEPHALUS, (*Bp.*) *Bd.—Yellow-headed Blackbird.*

On April 25th, at Hidalgo, we first met these impudent birds, associated with Cowbirds and Blue-headed Grackles, on a fence in the centre of the village. Three specimens were shot, and for a few days thereafter we saw them in the vicinity, flying about with Redwings and Cowbirds, after which we saw them no more. I am told they are very abundant during the winter months.

275—♂—10.50 x 18.25 x 5.75 x 4.00. Apr. 25, Hidalgo.
276—♂—10.25 x 17.00 x 5.50 x 4.00. Apr. 25, Hidalgo.
277—♂—11.00 x 18.00 x 5.75 x 4.35. Apr. 25, Hidalgo.

STURNELLA MAGNA, (*L.*) *Sw.—Field Lark.*

Common on the prairies, and whenever we drove or rode through them numbers were seen. We did not obtain var. *neglecta*, although it is undoubtedly common. Most of our time was spent among the timber, and the birds of the prairies were neglected.

86—♀—9.00 x 15.00 x 4.00 x 2.60. Mar. 26, Brownsville.

ICTERUS SPURIUS,* (*L.*) *Bp.—Orchard Oriole.*

Common everywhere in open woodland or mezquite chaparral. It likes to build in mezquite, wesatche, and willow-trees. They are exactly like the Northern birds in plumage, and vary from them only in size, and it takes close measuring to tell one from the other. The nests are nearly always made of bleached grasses, wholly or partially pensile, and without lining. Eggs bluish-white, sometimes pure white, with spots and hieroglyphics on larger end of deep brown, almost black. Average size of eggs is 0.84 by 0.57.

81—♂—7.25 x 9.75 x 3.00 x 2.50. Mar. 26, Brownsville.
316—♂—6.75 x 9.65 x 3.00 x 2.75. Apr. 30, Hidalgo.
317—♂—6.75 x 9.75 x 3.00 x 2.75. Apr. 30, Hidalgo.
318—♀—6.50 x 9.50 x 3.00 x 2.50. Apr. 30, Hidalgo.
319—♀—6.65 x 9.50 x 3.00 x 2.75. Apr. 30, Hidalgo.
320—♂—6.50 x 9.40 x 3.00 x 2.50. Apr. 30, Hidalgo.

ICTERUS BULLOCKI, (*Sw.*) *Bp.—Bullock's Oriole.*

So far as my experience went, this species was the rarest of the Orioles on the Rio Grande. Were I to compare the four kinds found there, I should say we saw twenty *cucullatus*, Hooded, to six *spurius*, Orchard, to four *auduboni*, Audubon's, to one *bullocki*, Bullock's. Most of my collecting and study of these birds was at Hidalgo; but as a few miles of distance along the river is apt to show a change in the avifauna, it is possible that at other points this proportion would be decidedly changed. Up to the time we left Hidalgo (May 11th), I only found one nest (May 7th), and that contained four fresh eggs of this species and one of *Molothrus ater obscurus*, Dwarf Cowbird. The nest was situated about ten feet from the ground, between two small horizontal branches in the thick foliage of the tree, and was composed of dried grasses and Spanish moss in about equal proportion, with no lining. The eggs are white, speckled with reddish-brown quite thickly on larger end, but sparsely over the other parts. The measurements are 0.96 by 0.60, 0.91 by 0.61, 0.90 by 0.60, and 0.90 by 0.60.

205—♂—8.50 x 12.50 x 4.00 x 2.75. Apr. 13, Brownsville.
344—♂—8.00 x 12.50 x 3.40 x 3.25. May 3, Hidalgo.
346—♂—8.60 x 13.50 x 4.00 x 3.40. May 3, Hidalgo.

ICTERUS CUCULLATUS, *Sw.—Hooded Oriole.*

Very common in the vicinity, and among timber of any respectable growth. I found it more plentiful than all the rest of the genus combined. Like all the Orioles, its colors vary greatly with age and season. But even in its best plumage, I think it looks better at a little

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*[The breeding bird of this locality being referable to Mr. Lawrence's *Xanthornus affinis*, the smaller Southern form.—E. C.]

distance, when its buttercup-colored hood contrasts well with its velvet-black mask. The birds are very active, and so full of song that the woods are filled with music all day long. The bills of these birds are more curved and pointed than the others, and admirably adapted for weaving the hair-like moss. Their usual nesting places are the hanging trusses of Spanish moss, everywhere provokingly abundant on the larger growth of trees. I have also found their nests on the lower limbs of trees and the drooping outer branches of undergrowth; but wherever found, the inevitable Spanish moss enters largely or wholly into their composition. So durable is this moss that it lasts for years, and as a consequence there are everywhere ten old nests to one new one. The heart of the moss when separated from its white covering becomes the "curled hair" of commerce. The Hooded Oriole takes this dry vegetable hair, and ingeniously weaves it into the heart of a living truss of moss, making a secure and handsome home. I took one no higher than my head, and others thirty feet or more from the ground. They make a great ado when their home is invaded.

Their complement of eggs is four, but sometimes five are found. Color of eggs white, nearly covered with scattered fine brown spots, and at large end with larger blotches of the same. Their shape is more pointed at both ends than others of the family. Their average size is 0.83 by 0.60. The longest is 0.90 and shortest 0.81, while the breadth shows no variation to speak of.

62—♂—8.00 x 10.56 x 3.50 x 3.85. Mar. 24, Brownsville.
135—♂—8.25 x 10.50 x 3.25 x 3.75. Apr. 2, Brownsville.
143—♂—8.00 x 10.50 x 3.50 x 3.75. Apr. 3, Brownsville.
144—♀—8.00 x 10.25 x 3.25 x 3.50. Apr. 3, Brownsville.
145—♀—8.00 x 10.00 x 3.25 x 3.50. Apr. 3, Brownsville.
239—♀—7.50 x 9.90 x 3.15 x 3.00. Apr. 19, Hidalgo.
256—♂—7.75 x 10.50 x 3.25 x 3.25. Apr. 20, Hidalgo.
257—♂—8.00 x 10.75 x 3.40 x 3.50. Apr. 20, Hidalgo.
288—♀—7.75 x 10.50 x 3.25 x 3.25. Apr. 28, Hidalgo.
305—♂—8.25 x 10.50 x 3.15 x 3.85. Apr. 30, Hidalgo.
306—♀—7.75 x 10.00 x 3.00 x 3.40. Apr. 30, Hidalgo.

ICTERUS AUDUBONI, *Giraud.*—*Audubon's Oriole.*

This large Oriole cannot be said to be very abundant on the Rio Grande, although it is by no means rare. I think it is by far more retiring in its habits than any other of the family. If I were to go in search of it I should seek a dense woods, near an opening, with plenty of undergrowth, where also the Rio Grande Jay loves to dwell. It is a sweet singer, never very generous with its music, and only singing when undisturbed.

I remember once sitting in the edge of a woods, watching the movements of some Wrens just outside, the only sounds to be heard in the woods being the discordant notes of the Rio Grande Jay, when suddenly, from over my head, there burst upon my ear a melody so sweet and enchanting that I sat entranced, and, listening, forgot all else. I soon discovered the whereabouts of the singer, and watched him as he flitted about from branch to branch, singing his wonderful song. I have no power to describe a bird's song, least of all this Oriole's.

I usually saw this species singly or in pairs; but once, in a woods full of dense undergrowth, I saw four or five quarrelling at a furious rate. After searching in vain for their nests, I at length shot one, but still they would not leave the place, and continued to scold and fight. After another bird was shot, they became quiet, and I saw no more of them. They were generally very shy, but at this time did not seem to care for me, and I was directed to them by their riotous proceedings. I did not secure any nests or eggs. These birds, like some others, are not so fine on close inspection, on account of the mingling of their colors, yellow, black, and green. They are sometimes sold as cage-birds; but for song and beauty, in their case, I would reverse the old adage, and say, "A bird in the bush is worth two in the hand." I regretted being obliged to leave them just as they had fairly begun laying.

141—♂—10.00 x 13.00 x 4.25 x 4.50. Apr. 3, Brownsville.
254—♀— 9.75 x 12.50 x 4.00 x 4.25. Apr. 20, Hidalgo.
386—♂— 9.75 x 13.25 x 4.00 x 4.40. May 7, Hidalgo.
418—♂— 9.50 x 13.00 x 4.10 x 4.25. May 11, Hidalgo.
419—♂— 9.75 x 12.75 x 4.00 x 4.25. May 11, Hidalgo.

SCOLECOPHAGUS CYANOCEPHALUS, (*Wagl.*) *Cab.—Blue-headed Grackle.*

Up to the first of May, this handsome Blackbird is abundant on the Lower Rio Grande, frequenting, with the other members of the family, streets, stables, and corrals in large numbers. About that time most of them leave for their great breeding places of the West. Many, however, remain to breed on our extreme southern border. I did not come upon their nests to know them, but I have a few sets that may prove to be theirs. The birds are easily distinguished from others of that section, if not alone by their steel-blue heads, certainly by their bright lemon-colored iris, which can be seen for a long distance. They are rather shy when breeding, but at other times under your very feet in the towns, though not quite so saucy as *Q. macrurus*, Great-tailed Grackle.

114—♂— 9.75 x 16.25 x 5.25 x 4.00. Mar. 30, Brownsville.
157—♂—10.25 x 16.75 x 7.25 x 4.25. Apr. 4, Brownsville.

QUISCALUS MACRURUS, *Sw.—Great-tailed Grackle.*

When I think of this bird, it is always with a smile. It is everywhere as abundant on the Rio Grande as is *Passer domesticus*, English Sparrow, in our northern cities, and, when about the habitations, equally as tame. This bird is as much a part of the life of Brownsville as the barrelero rolling along his cask of water or the mounted beggar going his daily rounds. In the towns or about the ranches, he knows no fear; is always noisy, never at rest, and in all places and positions; now making friends with the horses in the barns or the cattle in the fields, then in some tree pouring forth his notes, which I can liken only to the scrapings of a "cornstalk fiddle"; now stealing from porch or open window some ribbon for his nest, then following close behind the planter, quick to see the dropping corn. With all his boldness and curiosity, the boys of the streets say they cannot trap or catch him in a snare. He will take every bait or grain but the right one; he will put his feet among all sorts of rags but the right ones: and the boys are completely outwitted by a bird. He performs all sorts of antics. The most curious and laughable performance is a common one with him. Two males will take position facing each other on the ground or upon some shed, then together begin slowly raising their heads and twisting them most comically from side to side, all the time steadily eyeing each other, until their bills not only stand perpendicular to their bodies, but sometimes are thrown over nearly to their backs. After maintaining this awkward position for a time, they will gradually bring back their bills to their natural position, and the performance ends. It is somewhat after the fashion of clowns' doings in a circus, who slowly bend backward until their heads touch their heels, then proceed to straighten up again. It is a most amusing thing to see, and seems to be mere fun for the bird, for nothing serious grows out of it.

With all their familiarity, I have seen these birds in the open chaparral as wild and wary as other birds, knowing very well when out of gunshot range. Their flight is rather slow, and when they make an ascent it is labored; but once up, with their great tails and expanse of wing they make graceful descents.

As a general thing, they are gregarious in all their habits. Great numbers breed all along the river, usually in scattered colonies, similar to Redwings, but their nests are higher, and not often near the water. The ebony is a favorite tree for them to breed in; and wherever these trees exist in towns or about ranches they are always occupied with nests of these birds, sometimes in great numbers. My first eggs were taken from an ebony-tree near our room, in which were six or eight nests. They were found in great numbers in the young willows and rank undergrowth of the resacas; and in the great "heronry" in the salt-marshes, half-way between Brownsville and the coast, we obtained many eggs. We found their nests about two feet above the water in the rushes, and from four to thirty feet above the ground when in trees. They are shaped like those of our familiar Purple Grackle, *Q. purpureus*, and not much larger. They are composed of grasses principally; but, when convenient, papers, rags, feathers, anything, are woven in, and not infrequently mud is thrown in, as if to weight it down. Just how far north of the Rio Grande this species reaches, I cannot tell. On the northern end of Padre Island, at Corpus Christi Pass, I saw them in abundance, and about Corpus Christi also. No *Quiscalus major*, Jackdaw, was secured. The first eggs were taken April 25th. In shape they are very oblong, rounded at one end and pointed at the other, with the greatest diameter much nearer one end. The ground-color is usually of a greenish-white, clouded with purplish-brown from the small end as far as the centre, and sometimes over the whole egg. The markings are of a very dark brown, chiefly at the small end, and consist of pencillings, drops, and splashes irregularly and grotesquely put on. Of a very large series of eggs, the largest was 1.40 by 0.95, and the smallest 1.12 by 0.87, with an average of 1.27 by 0.87. The narrowest egg, 0.83, was next to the longest, being 1.39, thus showing great variation in shape.

37—♂—18.00 x 23.50 x 7.75 x 9.00. Mar. 15, Corpus Christi Pass.
117—♂—18.00 x 23.25 x 7.75 x 9.00. Mar. 30, Brownsville.
118—♀—14.00 x 19.25 x 6.00 x 6.00. Mar. 30, Brownsville.
129—♂—18.50 x 23.50 x 7.65 x 9.00. Mar. 31, Brownsville.
130—♂—18.50 x 24.00 x 7.75 x 9.00. Mar. 31, Brownsville.
131—♀—13.50 x 18.00 x 5.65 x 6.00. Mar. 31, Brownsville.

CORVIDÆ.

XANTHURA LUXUOSA, (*Less.*) *Bp.—Rio Grande Jay.*

This is the only representative of the family seen on the trip. It was first met with on April 2d, in the vicinity of Brownsville; but it was not until we reached the heavier timber about Hidalgo that we saw it in full force. They were there April 17th in pairs, and busy constructing homes. They are most frequently seen during the breeding season in the densest woods and thickets, but at other times I am told they are common visitors of the camp, the ranche, and the huts in the outskirts of towns, to the annoyance of all on account of their thieving propensities. They are not very shy, even when breeding, and I had no difficulty in obtaining all I desired. Only once, however, was I able to shoot two at once. I caught none in the act of destroying eggs and young of other birds, although I have some very strong circumstantial evidence of such being the case. As the only account I have seen of the finding of these nests and eggs within our border was given by Dr. Merrill * (by the way, they were obtained in this same locality last year), and as I am also fortunate in obtaining and thoroughly identifying quite a number of sets, I shall risk being tedious, and give copious notes.

My first nest was taken April 28th, from a mezquite-tree standing in a dense thicket not far from the river-bank, and contained four fresh eggs. It was situated in a fork about fifteen feet from the ground, and was composed of sticks lined with fine stems, and a rather bulky affair. Both birds were seen, and one shot. I made the boy that was with me understand that I wanted more eggs of the same kind. He professed perfect familiarity with "Pájaro verde", and, much to my surprise, brought me before night two sets, one of four, fresh, and one of three, hard incubated. He said both were found in small trees, and were situated about twice as high as his head, which would be nine or ten feet from the ground. On April 30th, I flushed a Red-billed Pigeon, *Columba flaviros-*

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* See Bulletin of the Nuttall Ornithological Club, i. n. 4, 89, Nov. 1876.

tris, from its nest, and, when I shot it, a Green Jay flew from its nest in the very direction of my bird. Here indeed was a double find of no ordinary occurrence. I secured both nests, and both birds of each nest in good shape, and in a very short time. The nest of the Jay was some nine feet from the ground on the outer branches of a small tree, and composed wholly of sticks and fine twigs. The sticks were so full of thorns that when they were crossed about among the lining branches more firmness was given to the nest than usual, and by cutting off the branches I could readily take it entire. The outside diameter is nine inches one way by eight the other; its depth four inches; inside, three and a half inches wide by two inches deep. The four eggs which it held contained chicks, and I saved only three. On May 1st, a set of four was secured, one of which contained large chicks. On May 2d, we found another nest with four eggs, hard incubated. Both birds were shot. This nest was some ten feet from the ground in the outer branches of a small tree, on the edge of a large tract of timber. It was composed of stems and twigs like the others, rather bulky, and by cutting off the branches could be saved. On May 6th, two fresh eggs were brought me by a Mexican. On May 8th, I discovered another nest not far from where I found the one on April 30th. The nest, only eight feet from the ground, was built close to the body of a small tree among some small branches, and was composed of twigs as usual, but it was not as large as the others. It contained two chicks just out, and one whole egg about ready to hatch. I took the egg, but could hardly retain its shape. The shape of the egg is very similar to *Cyanurus cristatus*, Blue Jay, with the same variations from double-pointed to double-rounded. The ground-color is usually light drab, tinged faintly with green, but I have one egg out of a set of four with the color dull yellowish-white. The markings are brown, sometimes distinctly spotted or speckled or streaked, and sometimes quite indistinct and clouded. The larger end has generally the heaviest markings. From nineteen eggs I have the following sizes:—The longest measures 1.20 by 0.82. The shortest is 1.02 by 0.80. The broadest is 1.16 by 0.87 and the narrowest is 1.07 by 0.73. The average is 1.10 by 0.79.

139—♂—12.05 x 15.25 x 4.85 x 5.50. Apr. 2, Brownsville.
203—♀—11.50 x 14.75 x 4.65 x 5.25. Apr. 10, Brownsville.
204—♂—11.50 x 14.50 x 4.50 x 5.50. Apr. 10, Brownsville.
285—♀—11.25 x 14.25 x 4.50 x 4.85. Apr. 27, Hidalgo.
293—♂—11.75 x 15.50 x 4.85 x 5.25. Apr. 28, Hidalgo.
321—♀—11.50 x 14.75 x 4.50 x 5.00. Apr. 30, Hidalgo.
322—♂—12.00 x 15.25 x 5.00 x 5.50. Apr. 30, Hidalgo.
332—♂—11.75 x 15.50 x 4.65 x 5.50. May 2, Hidalgo.
333—♀—11.50 x 15.50 x 4.50 x 5.50. May 2, Hidalgo.
356—♀—11.85 x 15.00 x 4.75 x 5.65. May 3, Hidalgo.

TYRANNIDÆ.

MILVULUS FORFICATUS, (*Gm.*) *Sw.*—*Swallow-tailed Flycatcher.*

These beautiful birds had just arrived on the Rio Grande from Mexico when we reached Brownsville. The sparsely wooded openings in the chaparral, and the pastures, with scattered clumps of bushes and trees, in the vicinity of the town, are admirably adapted to the wants of the "Scissor-tails". I found them as abundant as the Kingbirds, *T. carolinensis*, on the borders of the great lakes. Both sexes are alike, excepting that the female has much the shorter tail. We saw very few indeed at Hidalgo, owing to the great abundance of woods and chaparral; consequently we missed collecting their eggs. From a set and nest given me by Dr. Merrill I give the following description:—The nest was taken in a tree in front of the hospital at Fort Brown. It is composed of weeds, rags, and strings, in layers, and lined with a few rootlets and wool. Outside it is four and a half inches wide by two and three-fourths inches deep; inside, two and three-fourths inches wide by two inches deep. The five eggs are pure white, with a few large blotches over the larger half. They average 0.86 by 0.68.

67—♂—14.25 x 15.00 x 5.00 x 9.50. Mar. 24, Brownsville.
68—♂—14.25 x 15.50 x 5.12 x 9.50. Mar. 24, Brownsville.
69—♂—13.50 x 15.50 x 5.00 x 8.75. Mar. 24, Brownsville.
73—♂—14.50 x 15.50 x 4.85 x 9.50. Mar. 25, Brownsville.
78—♂—13.50 x 15.50 x 4.75 x 8.50. Mar. 25, Brownsville.
79—♀—12.00 x 14.75 x 4.50 x 7.00. Mar. 25, Brownsville.
80—♀—11.25 x 14.75 x 4.50 x 6.00. Mar. 25, Brownsville.
125—♂—14.50 x 15.75 x 5.00 x 9.00. Mar. 31, Brownsville.
150—♂—14.00 x 15.75 x 4.90 x 8.75. Apr. 3, Brownsville.
191—♀—11.75 x 15.00 x 4.65 x 6.50. Apr. 9, Brownsville.
215—♀—11.00 x 14.50 x 4.75 x 5.75. Apr. 17, Hidalgo.
374—♀—11.50 x 15.00 x 4.65 x 6.75. May 5, Hidalgo.

TYRANNUS CAROLINENSIS, (*L.*) *Bd.*—*Kingbird.*

On the 8th of May, at Lomita Ranche, a few miles from Hidalgo, I shot the only one of this species seen. It was in company with Couch's Flycatchers, *Tyrannus couchi*, on the topmost branches of the tall ebony-trees near the buildings of the ranche.

401—♂—9.00 x 15.10 x 4.50 x 3.50. May 8, Hidalgo.

TYRANNUS MELANCHOLICUS COUCHI, (*Bd.*) *Coues*—*Couch's Flycatcher.*

On May 8th, I saw a number of this species at Lomita Ranche, on the ebony-trees. Three were shot, but only one secured, the others being lost in the tall grass and thickets. At this point is the finest grove of ebonies I saw on the river. On the hillside, back of the buildings, they overlook the large resaca, then filled with tasselled corn. It was the tops of these grand old trees that these Flycatchers loved, and so persistent were they in staying there that I thought they were going to settle in the neighborhood for the season. There was a company of some six or eight scattered about. I did not find them shy, for after our firing they would almost immediately return to the same trees. It was readily distinguishable from *T. carolinensis*, which was shot in their company. Their greater size and bright yellow under parts can be seen at gunshot range.

393—♂—9.75 x 15.65 x 4.50 x 3.75. May 8, Hidalgo.

MYIARCHUS CRINITUS, (*L.*) *Cab.*—*Great-crested Flycatcher.*

While this bird was not very common, yet we came upon it occasionally. Nearly always seen in the open chaparral, in which one can leave the main travelled road, either on foot or horseback, and work around among the undergrowth and scattering, old, stunted trees.

240—♀—8.25 x 13.00 x 4.00 x 3.50. Apr. 19, Hidalgo.
420—♀—8.50 x 12.75 x 4.00 x 3.50. May 11, Hidalgo.

MYIARCHUS CRINITUS ERYTHROCERCUS, (*Scl. & Salv.*) *Coues.*

[? *Tyrannula irritabilis*, Bp. C. A. i. 1850, 189. (Supposed to belong here from quotation of Azara. "South America." Not *Tyrannus irritabilis* Vieill.)

Myiarchus crinitus var. *irritabilis* [" Vieill."], Coues, Pr. Phila. Acad. July, 1872, 65. (Monographic. Quotation of Vieillot inapplicable.)—B. B. & R. N. A. B. ii. 1874, 331. (Not *Tyrannus irritabilis* Vieill.)

? *Tyrannula mexicana*, Kaup, P. Z. S. 1851, 51. (Scarcely or not determinable; better not be used for any species.)

Myiarchus erythrocercus, Scl. & Salv. P. Z. S. 1868, 631, 632 (Venezuela).

Pyrocephalus (*Myiarchus*) *erythrocercus*, Gray, Handl. n. 5522.

Myiarchus mexicanus, Lawr. Ann. Lyc. N. Y. ix. 1869, 202 (Yucatan).

Myiarchus yucatanensis, Lawr. Pr. Phila. Acad. 1871, 235 (Yucatan. Name applied to the same specimen he called *mexicanus* in 1869.)

HAB.—Central and South America and Mexico. South to Paraguay. North to the Rio Grande of Texas (*Sennett*).

CH.—*M. crinito simillimus, sed notæo obscuriore* (*minus vegeto*), *gastræo dilutiore, abdomine subflavo, gula et pectore pallidè cinereis, rectricibus rufo et fusco ferè dimidiatis, rostro nigro, modico* (0.75).

Chars. subsp.—(Description of a specimen collected May 9, 1877, at Hidalgo, Texas, by G. B. Sennett.)—On comparing this bird with typical specimens of *M. crinitus*, taken at the same time, in the same place, and by the same person, it is immediately perceived to be different. The lateral tail-feathers have a stripe of fuscous-brown on the inner web adjoining the shaft, this stripe equalling or exceeding the width of the whole outer web of the respective feathers; whereas in *crinitus* there is only the narrowest possible dusky stripe on the inner web, or none at all. This dusky stripe is of uniform width throughout, not enlarged at the end to occupy most or all of the feather, as is the case with *cinerascens*. The entire upper parts are darker than those of *crinitus*—that is, they have a sordid brownish-olive cast, instead of the clearer and purer greenish-olive of *crinitus*. The yellow of the belly is much paler. The ash of the throat is decidedly lighter and clearer, and it comes farther down the breast, yielding to the yellow without the intervention of the olivaceous pectoral area which is usually conspicuous in *crinitus*. The general aspect of the under parts is much as in *cinerascens*, both the distribution and shade of the colors being more as witnessed in the latter than as seen in *crinitus*. The light edgings of the wing-feathers are also paler than those of *crinitus*. The bill is black, not dark brown, slenderer than in *crinitus*, but not longer than in one of the Texas specimens of *crinitus*, and, in fact, differing less from one of these than these do from each other. The bill in size is nothing like that of var. *cooperi*, nor has it the very constricted shape of that of *cinerascens*.

In fine, this bird is obviously different from ordinary *crinitus* of the United States. The general body-coloration is almost exactly as in *cinerascens*, from which it is at once distinguished by the different shape of the bill and different pattern of the tail-feathers. Agreeing very closely in colors with var. *cooperi* of Mexico, it is smaller than that species, and lacks in particular the enormous development of the bill, which, in *cooperi*, is an inch or more in length of culmen, and proportionately broad. It is clearly neither *crinitus* proper, nor *crinitus* var. *cooperi*, nor yet *cinerascens*.

Length 8¾; extent 12¾; wing 3⅞; tail 3⅝ (collector's measurements in the flesh); bill 0.75; tarsus 0.85; middle toe and claw 0.75.

This is the bird I called *crinitus* var. *irritabilis* in my monograph above cited, where I carefully distinguished it from its allies, and is also the bird distinguished with equal pains and accuracy by Mr. Ridgway, who adopted the same name for it. In choosing this name, I relied upon Bonaparte's reference of Vieillot's *Tyrannus irritabilis* to the Paraguayan bird described by Azara; but it appears from Dr. Sclater's published criticism, and also from a private note which he kindly sent me, that Bonaparte was wrong in this matter, Vieillot's *irritabilis* being really a synonym of *crinitus*, as usually cited. The first name which *may* belong here is the *Tyrannula mexicana* of Kaup—a perpetual stumbling-block, which has occasioned so much confusion that I will have nothing to do with it. In a word, it is impossible to identify Kaup's bird among the species of so difficult a group as this. It has been successively applied to every one of the Mexican *Myiarchi*, even to the small *M. lawrencii*, and by so accomplished an ornithologist as Dr. Sclater himself. Baird made it out to be the bird we now know as *cinerascens* Lawr., and his procedure was endorsed for many years by United States' writers. Sclater later, from examination of the type-specimen, considered Kaup's *mexicana* applicable to the large-billed form which Baird called *cooperi*. Mr. Lawrence, in 1869, applied the name *mexicana* to a Yucatan specimen of the very bird we are now considering, which he afterward, however, renamed *yucatanensis*, in deference to Dr. Sclater's statement that *mexicana* was the same as *cooperi* of Baird. These and other synonymatic points are fully discussed in my monograph.

Passing over *irritabilis* as being a synonym of *crinitus*, and *mexicana* as being something past finding out, unless it be var. *cooperi*, the first unquestionable and only tenable name of the present bird appears to be *erythrocercus* of Sclater and Salvin, which I accordingly adopt.

It is somewhat a matter of surprise that this particular variety of *Myiarchus* should occur in the United States, rather than the large-billed var. *cooperi;* but there is no reasonable question of the accuracy of my identification, which receives the support of Mr. Ridgway, who examined the bird with me. Var. *cooperi* seems to be a localized form of Southern and Western Mexico and contiguous portions of Central America. Var. *erythrocercus* has a very wide range in Central and South America. I have examined undoubted specimens from as far south as Paraguay, and others from Venezuela and Yucatan, whence the types of *erythrocercus* and *yucatanensis* were respectively derived, as well as from Costa Rica and Guatemala; but I have never seen a Mexican skin, nor has the species been attributed to Mexico so far as I recollect, unless Kaup's bird belongs here.

I learn from Mr. Sennett, and from another private source, that Dr. Merrill was really the first to secure this bird within the limits of the United States; but no record to such effect has appeared to date.—E. C.]

It was shot in open chaparral, and nothing was learned of its habits. Iris hazel.

409—♀—8.75 x 12.75 x 3.90 x 3.65. May 9, Hidalgo.

CONTOPUS VIRENS, (*L.*) *Cab.—Wood Pewee.*

But a single bird obtained, and no others recognized. It was shot by the roadside, near the camp at Hidalgo. I cannot account for the few small Flycatchers, Vireos, and Warblers seen along the river.

331—♀—6.50 x 10.00 x 3.10 x 2.50. May 2, Hidalgo.

EMPIDONAX MINIMUS, *Bd.—Least Flycatcher.*

I saw but this single specimen, which was obtained at Lomita Ranché.

It was shot from a low bush under a tree, where it was seen flitting back and forth after insects.

398—♀—5.50 x 8.10 x 2.35 x 2.10. May 8, Hidalgo.

PYROCEPHALUS RUBINEUS MEXICANUS, (*Scl.*) *Coues.—Vermilion Fly-catcher.*

This little beauty must be a very rare bird on our Southern border. If it were otherwise we should have seen much more of it, for it frequents just such places as we were in the habit of visiting almost daily, and its brilliant colors would certainly assist us in observing it. The few that we met with were rather shy and restless. At sight of us, they darted from one clump of bushes to another, keeping from four to six feet from the ground. The first male I shot was winged, and when caught fought with all the courage of its larger relatives.

113—♂—6.00 x 10.75 x 3.25 x 2.50. Mar. 29, Brownsville.
166—♂—6.10 x 10.50 x 3.25 x 2.50. Apr. 6, Brownsville.
315—♀—6.00 x 10.00 x 3.25 x 2.50. Apr. 30, Brownsville.

CAPRIMULGIDÆ.

NYCTIDROMUS AMERICANUS, (*L.*) *Cass.*

I was prepared to meet this bird, both by the account* of its discovery within our limits last year by Dr. Merrill, and by his personal description of it before my going up the river from Brownsville. Although I frequently heard it at night, yet I never saw it in the twilight, as I did *Chordeiles texensis*, the Texas Nighthawk. I saw them occasionally, singly and in pairs, about the thickets and open chaparral, and once in the canebrakes close to the woods. Although they lie close until one is full upon them, yet one has no chance after they are flushed, for they are no sooner out of one thicket than they are into or behind another. I refrained from making too much of an effort to shoot them until I should obtain their eggs; therefore, of the dozen or more seen I have yet to take the bird in hand. On April 25th I found one egg of this species; on May 1st, another; and on May 10th, two more, all of them fresh and perfect. They were found in open brush, on the bare ground. One of them was partly concealed by the branches of a low bush six or eight inches from the ground. Of the four eggs found I retain but two, which I describe. One egg is a rounded oval, and the other a pointed oval. The color is a rich creamy-buff. One is marked sparsely all over with indistinct spots of pink, and the other is thickly spotted and scratched with the same. One egg measures 1.28 by 0.92, the other 1.20 by 0.93 of an inch.

CHORDEILES TEXENSIS, *Lawr.—Texas Nighthawk.*

This bird is common on the Mexican border, at evening flitting around the habitations and by day sitting around the open mezquite chaparral.

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* [See Bull. of the Nutt. Ornith. Club, i. n. 4, 88, Nov. 1876.—Having seen no specimens, I take the name from *Cass.* Pr. Phila. Acad. 1851, 179, and *Cab.* Mus. Hein. iii. 1830, 92.—E. C.]

They were quite irregular, some evenings coming in large numbers and then again in few. Their habits are similar to *C. virginianus*, the Common Nighthawk. By their being ten times as abundant as *Nyctidromus albicollis*, one would suppose we would find many of their eggs, but we found none. The eggs are just the color of the ground, and the bushes are too thick to mark exactly where the bird leaves when flushed. A set of eggs given me by Dr. Merrill has the ground-color gray, on which are fine spots and scratches of drab over the entire surface. With these markings are clouded or indistinct ones of the same design. The shape is elliptical. One egg measures 1.04 by 0.78, and the other 1.05 by 0.78.

230— ♀ —8.75 x 20.75 x 6.90 x 4.00. Apr. 18, Hidalgo.
245— ♂ —9.00 x 22.00 x 7.50 x 4.60. Apr. 19, Hidalgo.
246— ♂ —8.75 x 22,00 x 7.50 x 4.10. Apr. 19, Hidalgo.
247— ♀ —8.50 x 21.00 x 7.25 x 4.00. Apr. 19, Hidalgo.
295— ♂ —8.50 x 20.50 x 7.00 x 3.90. Apr. 28, Hidalgo.
296— ♀ —8.65 x 21.00 x 7.10 x 4.10. Apr. 28, Hidalgo.
300— ♀ —8.75 x 21.50 x 7.25 x 4.25. Apr. 29, Hidalgo.
368— ♂ —8.50 x 20.25 x 6.65 x 4.00. May 5, Hidalgo.

TROCHILIDÆ.

TROCHILUS COLUBRIS, *L.—Ruby-throated Hummingbird.*

Of the two birds secured, one was shot while hovering about a blossoming tree, the other over flowers near the ground; both were females.

231— ♀ —3.25 x 4.50 x 1.75 x 1.12. Apr. 19, Hidalgo.
397— ♀ —3.75 x 4.50 x 1.75 x 1.15. May 8, Hidalgo.

AMAZILIA CERVINIVENTRIS, *Gould.—Rufous bellied Hummingbird.*

[As descriptions of this species are not very generally accessible, the following, taken from Mr. Sennett's specimen, is inserted:—

SP. CH.—Male. Upper parts shining golden-green, nearly uniform from head to tail, but top of the head rather darker, and with a reddish gloss in some lights, and upper tail-coverts somewhat shaded with reddish. Metallic gorget of great extent, reaching fairly on the breast, glittering green when viewed with the bill of the bird pointing toward the observer, dusky green when seen in the opposite direction. Less scintillating and more golden-green feathers extend a little farther on the breast and sides, and most of the under wing-coverts are similar. Belly and under tail-coverts dull rufous or pale cinnamon, relieved by flocculent snowy-white patches on the flanks. Wings blackish, with purple and violet lustre; all the primaries broad, and not peculiar in shape, though the outermost is narrower and more falcate than the rest. Tail large, forked about one-third of an inch; all the feathers broad, with simply rounded tips (no special emargination); color intense chestnut, having even a purplish tinge when viewed below, the middle feathers glossed with golden-green, especially noticeable at their ends, and all the rest tipped and edged for some distance from their ends with dusky. Tarsi appearing feathered nearly to the toes, but really naked except at the top in front. No lengthened ruffs or tufts about the head; no metallic scales on top of head, different from those of the upper parts at large; no special head-markings additional to the colors already described. Bill light-colored, probably flesh-colored in life, with the tip and commissural edge of the upper mandible dusky, quite broad and flattened at base, thence gradually tapering to the acuminate tip, slightly bent downward, the curve most noticeable just back of the middle. Nasal scale large and tumid; nasal slit entirely exposed; feathers extending in a point on the sides of the culmen, sweeping obliquely across the basal part of the nasal scale, and forming at the angle of the mouth a deep reëntrance with those of the chin, which reach much farther forward on the interramal space. Size large; length 4½; extent 5⅝; wing 2⅜; tail 1½, forked about ⅛; bill ⅞.—E. C.]

This is the second specimen of this species obtained within our limits, the first having been taken the previous year by Dr. Merrill.* This one was shot while hovering over wild flowers near the ground, among cactus and low bushes, not far from Brownsville. I saw a number of Hummers differing from these, but I could not get them, and did not make them out. It is difficult in this country to follow and secure large birds, much more these tiny creatures.

89—♂—4.50 x 5.65 x 2.35 x 1.50. Mar. 27, Brownsville.

ALCEDINIDÆ.

CERYLE ALCYON, (*L.*) *Boie.*—*Belted Kingfisher.*

While at Brownsville, I saw several of this species about the lagoons a few miles back from the river. They are by no means abundant.

CUCULIDÆ.

GEOCOCCYX CALIFORNIANUS, (*Less.*) *Bd.*—*Chaparral Cock.*

I saw this singular bird for the first time at Corpus Christi, but afterward found it common on the Rio Grande. At first I was unable to shoot them; but as I became more familiar with them I had no difficulty in securing all I wished. They are not wholly a ground bird, as has been said. They take to wing when alarmed, and frequently of their own accord. I have seen a pair fly from the edge of water to the woods, a distance of over a hundred yards, where they had an equal chance of getting out of sight by running. I saw two fly into a mezquite-tree, and shot one of them when it was at least ten feet from the ground. They invariably breed in trees or bushes. That they are good runners there is no doubt; but their powers in this direction, I think, have been overestimated. An examination of the feet of a large number of birds will show that they are used much more on the ground than in perching, yet it seems quite an effort for them to curl up the ends of the toes. The only sound I ever heard this bird make was what I supposed to be a call for its mate. I happened once to hear one around the bend of an unfrequented road in the woods in which I was strolling. I stood perfectly still, and it soon made its appearance, coming toward me, but still a long way off. It would run a few yards, calling at the same time, stop, listen for a few seconds, holding up its head in a very conceited way, and then start on again, calling. It seemed unconscious of my presence, and came so near to me that I could easily have shot it with the smallest charge, but I did not, as I wished to see if its mate would come. However, she did not. These birds are very fond of lizards, so common to this region. I have seen one jump several feet to catch a lizard sunning itself on a bush, and have shot others while engaged in eating them on the ground. Of their breeding habits there seems to be little known, and reports vary. As I was fortunate enough to find their nests, I will give the details, hoping to settle doubts. My first nest of this species I found near Hidalgo, on April 27th, in a tree surrounded by high, thorny bushes. It was a frail nest, composed of sticks and weeds, and lined with loose grasses. It was situated eight feet from the ground, in a broad crotch, close to the body of a tree, and contained nine eggs. A majority of them were fresh, but a few showed that incubation had taken place. The next nest was found April 28th, in a junco-bush, very near the village of Hidalgo. It was set in the thick mass of thorns, away from the body of the bush; was about five feet from the ground, composed of sticks and grasses, and contained one egg. It was visited for several days, but we could perceive no warmth to the egg, nor were others added to it. On May 3d, we took the egg, concluding that its parent had been shot. On May 4th, a nest containing four perfectly fresh eggs was found, about six feet from the ground, in a small tree in a very dense thicket. This was so far out of town, and in such a wild and unfamiliar section, that I dared not leave it for fear that I should not find it again. On the same day, I watched for some time a bird of this species carrying sticks for its nest, and although I could locate the thicket into which it took them, yet I could not penetrate it, although I tried several times thereafter. On May 9th, two perfectly fresh eggs were brought me by a Mexican, which he had taken from a nest in a bush. The depression of any nest was seldom deeper than the width of the egg. The first nest, with clutch of nine, could have held but two or three more eggs comfortably. From the fact that the nine eggs were warm when I found them, it is reasonable to suppose that the bird had begun to sit; and as none of them showed much development of embryo, she could not have been a very long time at it. The natives told me stories about these birds beginning to sit from the time they commence to lay, and continuing to sit throughout the season; that a large number of eggs are laid, and a considerable time intervening between the laying of any two; as a consequence, the bird of the first egg would become fully grown before the last egg of the season was laid. On May 20th, as I was about taking the steamer at Point Isabel, a boy brought me a young one of this species about one-fourth grown, the first and only chick seen by me. I put no faith in the stories mentioned above, nor in accounts of these birds attacking and mastering the large rattlesnakes of the country. From my observations, their complement of eggs is from eight to twelve. The eggs are very uniform in shape and size, double-rounded; rarely one is found with tendency toward a point. Length varies from 1.57 to 1.42; breadth from 1.23 to 1.20; average of the sixteen eggs before me is 1.50 by 1.21. Color pure white.

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* See Bulletin of Nuttall Orn. Club, ii. n. 1, 26, Jan. 1877.

106—♂—23.00 x 21.50 x 7.00 x 11.50. Mar. 29, Brownsville.
261—♀—22.00 x 20.00 x 6.50 x 10.50. Apr. 20, Hidalgo.
273—♀—21.25 x 19.50 x 6.25 x 10.00 Apr. 25, Hidalgo.

286—♀—21.50 x 20.00 x 6.85 x 10.75. Apr. 27, Hidalgo.
358—♀—21.50 x 20.00 x 6.50 x 10.50. May 4, Hidalgo.
366—♀—21.00 x 19.50 x 6.25 x 9.75. May 5, Hidalgo.
382—♂—22.00 x 20.00 x 6.50 x 10.25. May 6, Hidalgo.
405—♀—21.00 x 20.00 x 6.10 x 10.00 May 8, Hidalgo.

COCCYGUS AMERICANUS, (*L.*) *Bp.—Yellow-billed Cuckoo.*

I met this species occasionally. Several sets of eggs were brought me, and the boys were positive of their belonging to this bird, as they undoubtedly do. Their shape is long, double-rounded. Their color is rich pea-green. Their average size is 1.20 by 0.92.

379—♀—12.00 x 17.00 x 5.90 x 5.75. May 6, Hidalgo.

PICIDÆ.

PICUS SCALARIS, *Wagler.—Texas Woodpecker.*

This and *Centurus aurifrons* are the only ones of the family we found on the Rio Grande. The former, though not so abundant as the latter, is found common among the timber and mezquite chaparral. The soft-wood telegraph poles give proof also of the numbers of both species. I saw nothing in the habits of this small Woodpecker differing from our Downy Woodpecker of the North. Suitable trees for their nests were some distance out of Brownsville, and as we were not allowed to tamper with the government telegraph poles, we did not secure eggs at that place. When we reached Hidalgo, the season was pretty far advanced for them, and when we found their nests they all contained young. I found one nest, with four young, in the heart of the village. This bird breeds earlier than the Yellow-faced Woodpecker. April 29th, I flushed a bird from its nest, seven feet from the ground, in a partially decayed tree, and found within three young and one perfect egg, which fortunately was not fertilized. At another time, another nest of this species was found containing young and one egg. I took it to our room, and laid it on the table with other eggs. The next day, when going to blow it, imagine my surprise to see it in halves and a young bird exposed. The chick had pecked around the greater diameter until it had parted as nicely as could be. Both eggs have the greatest diameter nearer one end than the other. Their color is clear glassy-white. The size of the whole one is 0.77 by 0.60. That of the broken one is certainly no longer, and may be 0.05 of an inch broader. These facts and figures are so at variance with the description of egg given by Baird, Brewer and Ridgway in "North American Birds", ii. 519, that I must believe that they have given a description of some other egg. Their description answers so nearly to the egg of *Centurus aurifrons*, that I should say it referred to the latter, rather than to *Picus scalaris*.

65—♂—7.00 x 13.25 x 4.00 x 2.75. Mar. 24, Brownsville.
75—♂—7.50 x 13.50 x 4.10 x 2.25. Mar. 25, Brownsville.
147—♂—7.50 x 13.25 x 4.00 x 2.40. Apr. 3, Brownsville.
148—♀—7.10 x 13.00 x 4.05 x 2.50. Apr. 3, Brownsville.
214—♂—7.25 x 13.25 x 4.00 x 2.50. Apr. 17, Hidalgo.
355—♀—7.25 x 13.00 x 3.85 x 2.40. May 3, Hidalgo.

CENTURUS AURIFRONS, (*Wagl.*) *Gray.—Yellow-faced Woodpecker.*

Abundant everywhere in timber on the Rio Grande, and not very shy. I had ample opportunity to observe this species. It is rather more quiet than its near relative of the North. It builds its nest at all heights (sometimes so low a man can reach it from the ground), in any sort of tree, whether dead or alive. The square government telegraph poles are its favorite nesting-place. There is hardly a pole free from their holes, and in one I counted ten; probably some were made by their only relative of that section, *Picus scalaris*, Texas Woodpecker. They build much in live trees, dead timber being very scarce, but in them their holes could not be so readily seen. About May 1st, they had but fairly begun to lay, so that we were not long enough among their favorite resorts to secure many eggs. On May 3d, I secured a set of three fresh eggs, about ten feet from the ground, in an old dead tree, and shot the bird. On the same day, I secured another set of four from a nest only seven feet from the ground, in a hollow stub of a live tree. On May 8th, I was shown a hole about twenty feet from the ground in the crotch of a tree at the camp. In it I was told there were six or seven eggs. I could not take time then to get them, and did not go there again before leaving. The birds had been watched since they had taken possession of the tree, and were fully identified. Eggs are oblong-oval and clear glassy-white. They vary little in size, averaging 1.02 by 0.76.

64—♂—10.00 x 17.00 x 5.25 x 3.75. Mar. 24, Brownsville.
76—♂—10.00 x 17.00 x 5.25 x 3.25. Mar. 25, Brownsville.
77—♂—10.50 x 17.50 x 5.50 x 3.40. Mar. 25, Brownsville.
94—♂— 9.75 x 17.50 x 5.50 x 3.50. Mar. 27, Brownsville.
149—♂—10.00 x 17.50 x 5.25 x 3.50. Apr. 3, Brownsville.
216—♂— 9.75 x 17.50 x 5.50 x 3.50. Apr. 17, Hidalgo.
217—♂—10.25 x 17.50 x 5.25 x 3.25. Apr. 17, Hidalgo.
354—♀— 9.50 x 16.25 x 4.90 x 3.15. May 3, Hidalgo.

STRIGIDÆ.

STRIX FLAMMEA AMERICANA, (*Aud.*) *Coues.—Barn Owl.*

The only opportunity I had of observing these birds in a state of freedom was while on the steamer going up and down the river. Their holes in the banks were seen frequently, and occasionally a bird would be sitting in one of them. At Brownsville I was told that they occupied the belfry of the hospital, also the attic of one of the society halls in the city. Two birds were brought alive to me just before leaving for home. No eggs were secured.

BUBO VIRGINIANUS, (*Gm.*) *Bp.—Great Horned Owl.*

In the latter part of April, Mr. Webster gave chase to a pair of these birds, but did not succeed in securing them.

?**SCOPS ASIO MACCALLI**, (*Cass.*) *Coues.—McCall's Owl.*

On April 23d, while on the side of a gully in the edge of a woods, I flushed a bird of this species from its nest above my head. The Owl alighted in a tree so close to me that had I given it a full charge of No. 9 shot it would have been blown to pieces. I watched it some time in hopes it would fly a little farther off; but it had no idea of taking its eyes from me. I therefore gave it a half charge of dust, and, to my surprise, it got away from me. It was in very light gray plumage, and looked to me like a faded specimen of our Northeastern bird. The nest contained three perfectly fresh eggs, was situated about ten feet from the ground in a dead stub about nine inches in diameter, and so weak and rotten that I could have pushed it over. The eggs are pure white, and nearly round. They measure 1.35 by 1.12, 1.35 by 1.18, and 1.40 by 1.17. The location was about four miles from Hidalgo, up the river, and within about one-fourth of a mile of its bank.*

GLAUCIDIUM FERRUGINEUM.—*Ferrugineous Owl.*

[♂ *vertice toto albido lineato nec punctato, caudâ totâ ferrugineâ tæniis septem ad novem fusco-nigris regulariter transfasciatâ; dorso olivaceo-fusco, innotato; scapularibus maculis magnis singularibus aut binis subterminalibus notatis; torque nuchali nigro, albido et luteo variegato; remigibus dorso concoloribus, rufo transfasciatis, necnon intus albido dentatis; rostro e flavo virescente, iridibus flavis; long. tot.* 6½ *poll., alar. exp.* 14; *alæ* 3½; *caudæ* 2½.

♂, adult, in the "brown" or normal plumage: Tail entirely ferrugineous, or light chestnut-red, crossed with 7 to 9 bars of blackish-brown—these bars of the same width as the rufous interspaces, and both sets of markings quite regular and transverse. (These tail-marks distinguish the species in any plumage from *G. gnoma.*) Entire top of the head, above the superciliary ridges, and sides of the head behind the auriculars, olivaceous-brown, like the back, but streaked with small, sharp, and distinct lines of white or fulvous-whitish; these markings being on the forehead and most of the crown like pin-scratches in the sharpness of their definition, and though a little less so behind the ears, everywhere retaining their narrow linear character. (In *G. gnoma*, the head-markings are dots and spots, not lines.) Back like the head, olivaceous-brown, but without markings, except on the scapulars, most of which feathers have each one a large, rounded, white spot on the outer web near the end, and more or fewer pairs of fulvous spots farther along on both webs. Color of back and head divided by an obvious cervical collar, consisting of a series of diffuse whitish, and another similar of fulvous spots, separated by a nearly continuous line of black. Upper tail-coverts usually more or less rufescent, approximating to the ground-color of the tail itself. Remiges olivaceous-fuscous, like the back, the primaries imperfectly and indistinctly, the secondaries completely and decidedly, cross-barred with numerous rufescent bands, narrower than the dark intervals, besides which markings some of the primaries have an incompleted series of small whitish or very pale fulvous spots along the outer edge, and all have large and deep indentations of white or whitish along the inner web—these white indentations increasing in size from the ends toward the bases of all the feathers, and also growing larger on individual feathers from the outer primaries to the inner secondaries, on which last they reach quite across the under webs. Lining of wings white, with an oblique dark bar, and another curved dark bar, the latter across the ends of the under coverts. The under parts are difficult of description, owing to the diffuseness of the markings; we may say ground-color of under parts white, heavily streaked along the sides with the color of the back; this color extending quite across the breast, where, however, the feathers have centrally dilated shaft-lines of whitish; chin and throat white, divided into two areas by a blackish or dark gular collar, which curves across from one postauricular region to the other. Auriculars dark, sharply scratched with white shaft-lines, bounded below by the pure white of the malar region. Eyebrows white, pretty definitely bounded above by the color of the crown. Region immediately about the bill whitish, but mixed with the long, heavy, black bristles that project far beyond the bill, which latter is greenish at base, growing dull yellowish at the end. The sparsely haired toes are somewhat like the bill; the claws are brownish-black. Iris lemon-yellow. Length about 6¼ inches; alar expanse 14; wing 3¼; tail 2¼; tarsus ½; middle toe without claw about the same, its claw ⅜.

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* [Having examined no specimens, the identification is tentative.—E. C.]

The foregoing description is taken from an adult male procured May 8, 1877, at Hidalgo, Texas, by Mr. George B. Sennett—the second specimen known to have occurred within our limits, the first having been discovered by Capt. C. Bendire, near Tucson, Arizona in 1872. In the description, however, some allowance has been made for the known variations which the species presents. But the bird, like others of the genus, and like many other Owls, is dichrous—that is, it occurs under two phases of coloration, one being the "normal" plumage, as just given, the other being the condition known as *erythrism*, or rufescence. The latter is as follows:—

Entire upper parts deep rufous-red, with the lighter markings of the head, &c., obsolete or entirely obliterated; tail the same, with dark bars scarcely traceable. Dark cervical collar, however, conspicuous. White of the under parts tinged with yellowish or fulvous; the markings of the under parts similar in color to the ground of the upper parts, but duller and paler; tibiæ rufous, without markings. Gular collar blackish. Various intermediate stages have been observed, and it is presumed that the species is to be found in every degree of transition from the slightest departure from the normal state to the complete assumption of the erythritic condition.

♀: These color conditions are common to both sexes. The female is only distinguished from the male by her superior size. Length 7 inches or more; wing 4 or rather more; tail nearly 3; tarsus ⅝.

In extreme cases, the rufous becomes intense and almost uniform, a light rufous replacing even the white of the under parts, and there being no traces left of bars on the wings or tail. Mr. Ridgway speaks of having examined over fifty specimens, finding "every possible shade" between the two extremes described.—E. C.]

About noon on May 8th, when about three miles from Hidalgo, as Mr. Dean and I were riding toward the town, he asked me if I wanted a Nighthawk or something like it, high up in an ash-tree on his side of the road. I told him to shoot, and I would soon tell him. After firing, the bird sailed down into the thick woods. As soon as the bird was "marked down", we plunged in with our horses, through the thorns and undergrowth, and in a short time I found this beautiful little Owl, with face down and wings spread out upon the ground, perfectly lifeless. This was the first Owl smaller than *Nyctale acadica*, Acadian Owl, that I had had ever captured. Small Owls were frequently heard evenings and cloudy days when passing by the woods, but no others were seen.

402—♂—6.50 x 14.00 x 3.50 x 2.45. May 8, Hidalgo.

FALCONIDÆ.

CIRCUS CYANEUS HUDSONIUS, (*L.*) *Coues*.—*Marsh Hawk*.

This is far the most common Hawk seen on the trip. We met it at Galveston, Corpus Christi, and on the Rio Grande. Only a few in perfect blue plumage seen, and none secured. Two or three were shot, but, falling in the dense chaparral, were lost to us.

104—♀—21.25 x 49.00 x 15.50 x 9.50. Mar. 27, Brownsville.

ICTINIA SUBCŒRULEA, (*Bartr.*) *Coues.**—*Mississippi Kite.*

On May 7th, I saw several small flocks of these birds in close succession, and watched them with my glass. They were too high to shoot, but the white head and black square tails were plainly seen, and I have no doubts of their being this bird. They were moving north, and among them were some with white tails. There were about fifty in all, sailing in circles and drifting northward.

ELANOIDES FORFICATUS, (*L.*) *Coues.*†—*Swallow-tailed Kite.*

On March 24th, a few miles north of Brownsville, my companion shot a fine specimen of this splendid Hawk. When it was wounded, others gathered about to the number of eighteen. He was in the denseat of chaparral at the time; one or two others shot were not recovered. About March 12th, at Corpus Christi, one was seen. On April 24th, at Hidalgo, we saw three fly over the village.

71—♀—24.00 x 51.00 x 17.25 x 13.50. Mar. 24, Brownsville.

ACCIPITER COOPERI, *Bp.*—*Cooper's Hawk.*

Common in open chaparral and on the prairies.

340—♂—16.75 x 30.00 x 9.25 x 8.00. May 2, Hidalgo.

FALCO COLUMBARIUS, *L.*—*Pigeon Hawk.*

This bird had in its crop nearly the whole of a Ground Dove, *Chamæpelia passerina.* Common in thinly wooded districts.

87—♀—12.50 x 26.50 x 8.60 x 6.00. Mar. 27, Brownsville.

FALCO SPARVERIUS, *L.*—*Sparrow Hawk.*

Common in open woodland, where it can have free chase for prey. I have found them in harmony with the Scissor-tailed Flycatchers, *Milvulus forficatus*, and Common Dove, *Zenædura carolinensis*, in open fields, where were a few scattered trees and bushes.

12—♂—11.00 x 23.00 x 7.75 x 0.00. Mar. 8, Corpus Christi.
93—♂—10.75 x 23.25 x 7.75 x 5.50. Mar. 27, Brownsville.

BUTEO UNICINCTUS HARRISI, (*Aud.*) *Ridg.*—*Harris's Buzzard.*

This dark Hawk was seen everywhere along the Rio Grande, but in especially large numbers in the vicinity of the large packing-house some three miles from Brownsville. There it could be seen at all times in the day, perched on the telegraph poles and trees along the railway track, watching the Turkey Buzzards, *Cathartes aura*, Black Vultures, *Cathartes atratus*, and Audubon's Caracaras, *Polyborus auduboni*, holding carnival over the offal scattered about in great heaps. By driving our ambulance by the side of the track, we could shoot from it, and in this manner obtained several of this species. They are sluggish carrion-feeding birds, but withal pretty shy. At a distance, they look black, and are easily recognized from any others of the family. They build in various places, from an eight-foot Spanish bayonet, or small tree, to a crotch forty feet high. The nests are composed of sticks and leaves, and are quite bulky. I was with Dr. Merrill when he examined two nests. One was on a Spanish bayonet, some eight or nine feet high, and the other in a tree about fifteen feet above the ground. At Hidalgo, I secured two sets of two eggs each. One set was taken April 29th from a nest ten feet from the ground in a mezquite-tree, surrounded by small trees. One egg contained a peeping chick, and the other was addled. The other set was taken May 1st by Mr. Barton from a tall ebony-tree. The eggs were fresh. The shape of the egg is nearly double-rounded, but slightly tending to point at one end. The color is pure dead white. The sizes are as follows:—2.10 by 1.70, 2.05 by 1.70, 2.10 by 1.70, and 2.08 by 1.69, averaging 2.08 by 1.70.

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*[*Ictinia mississippiensis*, auct. ex Wils.—*Falco subcærulius*, Bartr. Trav. Fla. 1791, 290.—*Ictinia subcærulea*, Coues, Pr. Phila. Acad. 1876, 345, *q. v.*—E. C.]

†[*Falco forficatus*, L. 1758.—*Nauclerus forficatus*, Ridgw. 1874.—*Elanoides forficatus*, Coues, Pr. Phila. Acad. 1876, 345, *q. v.*—E. C.]

1.03—♂—20.00 x 41.00 x 12.25 x 8.75. Mar. 27, Brownsville.
1.55—♂—22.00 x 48.00 x 15.00 x 10.00. Apr. 3, Brownsville.
1.56—♀—20.00 x 46.00 x 14.00 x 9.00. Apr. 3, Brownsville.
3.65—♀—22.50 x 47.00 x 14.50 x 9.50. May 4, Hidalgo.
3.90—♂—20.00 x 44.00 x 13.00 x 8.75. May 7, Hidalgo.

BUTEO PENNSYLVANICUS, (*Wils.*) *Bp.—Broad-winged Buzzard.*

The single one was shot on May 7th in a dense woods. It was mistaken for an Owl, when, at my approach, it flew from one tree to another, and I was quite surprised when I picked it up.

3.88—♂—15.50 x 36.00 x 11.25 x 6.50. May 7, Hidalgo.

ARCHIBUTEO FERRUGINEUS, (*Licht.*) *Gr.—Ferrugineous Buzzard.*

On May 16th I found an immense nest on the top of a large Spanish bayonet, and some twelve feet from the ground. There was no bird near, and I knew not whether it was occupied or not. By cutting off the needle-points of the leaves, my Mexican guide, with considerable help, was able to scale it, and, to my surprise, brought down two large eggs. While I was trying to identify them, on came the owners, a pair of this species, circling and screaming above our heads, but not near enough for a sure shot. Caught in the act as we were, with nothing for cover better than a Spanish bayonet or a low cactus, and being in the very home of six-foot rattlesnakes, I saw no practicable way of securing the birds. Later on the same day we came upon another nest, and a pair of the same species. This time they were within easy range as they flew over our heads; but our wagon was covered, and before we could get out of the awkward thing to shoot they were out of range. This nest was empty, but had the appearance of being new; was very bulky, similar to the former one, and, like it, situated on a Spanish bayonet, about eight feet from the ground. Dr. Merrill was with me. We both had a fine view of the birds, and their identification was complete. The locality was a sandy ridge, dividing a lake from the salt-marshes. The eggs were perfectly fresh. The shape is like those of Harris's Buzzard (*Buteo harrisi*); but for a tendency to be pointed at one end, would be a broad oval. They are pure chalky-white. One of them had very faint flecks of yellowish-brown scattered sparsely over it. The other was without any. Both of them have a few longitudinal creases. One measures 2.40 by 1.90, and the other 2.38 by 1.90.

POLYBORUS THARUS AUDUBONI, (*Cass.*) *Ridg.—Audubon's Caracara.*

On my way down the coast, I saw this bird for the first time at Corpus Christi, and again on the northern end of Padre Island. But not until I came near the slaughter-houses near Brownsville did I find it very abundant. There, at almost any time in the day, numbers can be seen with the Vultures, feeding upon the offal. When not feeding, they were seen in pairs, on the ground or low dead stubs, and were quite tame. Their flight is low at this season as they skim over the top of the chaparral and among the mezquite groves. I did not see them circling and sailing to great heights, as they are said to do. They walk, run, and hop readily, as I learned when chasing a winged bird through the thorns and thickets. I never heard them utter a cry of any kind. The sexes are alike, and it takes several years to acquire their full plumage; hence the majority of the birds are yellowish-brown. Considering the number of birds, it is surprising how few nests are found. I spent much valuable time in search for them, but without success. Dr. Merrill, however, was more fortunate. His familiarity with country and birds gave him a great advantage, and through his kindness I got chance at a nest. We together took a set of two from the nest. He afterward gave me the set. This nest was composed of sticks and a few leaves, and rested on the branches of a sapling only about nine or ten feet from the ground. This small tree was one of a clump which stood under larger trees, and was so slender that great care had to be taken not to shake out the eggs in getting to them. It was bulky, and with but little depression. One of the eggs is round at one end and inclined to be pointed at the other; the other is quite double-rounded. The ground-color is a rich cinnamon-brown. They are blotched with reddish-brown in great irregular clusters over the whole egg, and on these are small black blotches. My two eggs measure 2.30 by 1.85 and 2.15 by 1.82. A pair given Mr. Webster are 2.40 by 1.86 and 2.32 by 1.85.

83—♂ ad. —21.50 x 48.50 x 15.25 x 9.00. Mar. 26, Brownsville.
99—♀ ad. —23.00 x 49.50 x 15.25 x 8.25. Mar. 27, Brownsville.
100—♂ jun.—22.00 x 47.50 x 14.25 x 7.75. Mar. 27, Brownsville.
101—♂ —22.00 x 49.00 x 15.00 x 7.25. Mar. 27, Brownsville.
102—♀ jun.—23.00 x 48.50 x 15.50 x 8.00. Mar. 27, Brownsville.

CATHARTIDÆ.

CATHARTES AURA, (*L.*) *Ill.—Turkey Buzzard.*

Abundant, but not so much so as *Cathartes atratus*, Black Vulture. At Hidalgo, two sets of eggs were found in the open woodland on the bare ground, with no sign of nest. The shape is nearly oval, but sometimes one end is more pointed than the other. The color is light drab, spotted and blotched with dark reddish-brown, rather regularly, but not thickly, over the whole egg. One egg has a complete ring of spots very close to one end. They measure 2.70 by 1.80, 2.65 by 1.90, 2.58 by 1.85, and 2.70 by 1.90.

223—♀—26.00 x 66.00 x 20.50 x 10.25 x 10.25. Apr. 17, Hidalgo.

CATHARTES ATRATUS, (*Bartr.*) *Less.*—*Black Vulture.*

The most abundant of all the carrion-feeding birds on the Lower Rio Grande. I found it much more numerous in the vicinity of Brownsville than on the coast or farther up the river. Nowhere was it frequenting the towns, as it is said to do in other sections, but preferred the country, and especially the river-banks. Wherever there are slaughter-houses or large herds of cattle, it is sure to be. One of the saddest sights of our slow progress up the river was to see the poor cattle that had strayed away from their drinking-fords and were mired in the quicksand. The only interest taken in their fate was manifested by the ever-ready horde of Vultures who were frolicking near, in anticipation of their approaching feast. Two sets of eggs of two each were found in the vicinity of Hidalgo. Both were laid upon the bare ground in the woods, one set being at the root of a mezquite-tree. They are shaped oblong-oval, but one end more pointed than the other, and their ground-color is white, tinged with green. The markings are brown blotches of all sizes and shades of distinctness, and almost entirely confined to the larger end. On the brown are a few black spots. The eggs measure 3 by 2.05, 3.10 by 2.10, 3.02 by 1.95, and 2.94 by 1.95.

COLUMBIDÆ.

COLUMBA FLAVIROSTRIS, *Wagler.*—*Red-billed Pigeon.*

I found this fine large Pigeon common in heavy timber, more especially in the tall scattered clumps near the larger tracts. Its appearance is so marked that it can be recognized at all times from other members of the family. Like all the Pigeons, it is fond of the water. Any morning will find numbers of all the different species going to and coming from the sand-bars in the river, where they are in the habit of drinking and bathing.

The cooing of this bird is clear, short, and rather high-pitched. It is more secluded in its habits than any of the others, except the one I have lately found new to our fauna, *Æchmoptila albifrons.* In point of numbers it is much less numerous than the Carolina and the White-winged Doves; still it is quite extensively shot for market. I found it breeding, and secured several sets of nests and eggs. As the accounts given respecting its breeding habits are very meagre, I will give in detail my observations.

On April 30th, I found my first nest of this bird in the vicinity of Hidalgo. The locality was a grove of large trees, with undergrowth, and clumps of bushes matted with vines. While prying about the thick vines, I flushed the bird off its nest, and it alighted in one of the tall trees near by. It took me but a moment or two to examine the nest and shoot the bird. In less than ten minutes' time I had also its mate. The nest was only eight or nine feet from the ground, and set upon the horizontal branches of a sapling in the midst of the vines. It was composed of sticks, lined with fine stems and grasses, had a depression of an inch or more, and was about eight inches in outside diameter by two and one-half inches deep. It contained one egg, with embryo just formed. Dissection of the bird showed that she would have laid no more.

On May 3d, I found another nest very similarly situated in a dense thicket on the border of a woods. The bird was seen; the nest contained one addled egg.

On May 8th, at Lomita Ranche, a few miles above Hidalgo, in the fine grove of ebonies in the rear of the buildings of the ranche, I found two nests. Both were well up in the trees, one about twenty-five feet and the other about thirty. The nests were situated close to the body of the trees, on large branches, and were composed of sticks and grasses, with an inside depth of about two inches. One contained a single egg, far advanced; in the other, also, lay a solitary egg, from which a young chick was just emerging. The parents persisted in staying about, notwithstanding we were making a great disturbance, even shooting into the same trees. Whenever we would go off some distance, they would immediately go on their nests, and seemed loth to leave them at our return. These were the only ones seen breeding so near habitations.

The grove was a common resort for man and beast, besides being the place where wagons, tools, &c., were kept and repaired.

On May 11th, I obtained my fifth and last nest. I found it in the woods at the fork of two roads, a mile or so from the village, down the river. This nest I had discovered a week or so before, complete, but empty. It was situated about ten feet from the ground, in one of a thick clump of small trees, at the junction of several small branches. It was composed of twigs and rootlets, without grasses, and had a depression of one and one-half inches. The bird was flushed from the nest and shot. Upon examination, the solitary egg showed that incubation had begun, and dissection of the bird proved that no other eggs were developed for laying.

From my observations, I conclude that the Red-billed Pigeon breeds on our extreme southern border during April and May; that it builds a nest differing from those of other Pigeons, and lays but one egg. The only authority at my command mentioning the habits of this species is "North American Birds", by Baird, Brewer and Ridgway. In vol. iii., page 367, mention is made of the *two* eggs of this bird being somewhat larger than those of *Z. carolinensis*, Carolina Dove. The same page gives description and size of the eggs (1.18 by 0.90) in the Berlandier collection.

Now these statements apply so exactly to the egg of the White-winged Dove, *Melopelia leucoptera*, and are so decidedly at variance with my experience, that I have no hesitation in saying that undoubtedly Dr. Berlandier and the Mexican were laboring under a mistake, both having the eggs of *Melopelia leucoptera* (see my description of this further on), instead of *Columba flavirostris*. The shape of my five eggs of the bird under consideration is oblong-oval, with the greatest diameter in the centre. Some vary slightly, tending sometimes to double-pointed, and again to double-rounded. Their color is pure white. They measure 1.60 by 1.10, 1.55 by 1.12, 1.60 by 1.08, 1.48 by 1.08, and 1.46 by 1.07, averaging 1.54 by 1.09.

233— ♂—14.00 x 25.00 x 8.50 x 4.75. Apr. 19, Hidalgo.
260—♀—14.60 x 24.50 x 7.90 x 5.00. Apr. 20, Hidalgo.
323—♀—14.25 x 23.25 x 7.50 x 5.00. Apr. 30, Hidalgo.
324—♂—14.75 x 25.00 x 7.75 x 5.00. Apr. 30, Hidalgo.
408—♂—13.75 x 24.75 x 7.75 x 4.75. May 9, Hidalgo.
422—♂—14.00 x 24.50 x 8.00 x 4.65. May 11, Hidalgo.

ZENÆDURA CAROLINENSIS, (*L.*) *Bp.—Carolina Dove.*

This bird was most abundant of all the Pigeons wherever we went. At Galveston and Corpus Christi, on the way down, and at Brownsville, up to about April 10th, they were in flocks. When I reached Hidalgo, April 17th, they were mating, and they filled the air with the sound of their cooing. On April 25th, I found the first two eggs, and soon thereafter they became abundant. By the first of May, we came upon their nests in all sorts of places and at all heights, within from two to eight feet from the ground, but never on the ground. Their construction was usually a small, simple platform of twigs, with the slightest depression. Frequently they were made of bleached grasses alone. It was a very pretty sight to see one of these nests of yellow grass, with its snow-white eggs. This bird is at all times very tame, and when sitting on its eggs will often allow one to come within two feet of it to observe it. Of some fifty eggs, the average is 1.10 by 0.82.

25— ♀—12.25 x 18 25 x 5.75 x 5.50. Mar. 8, Corpus Christi.
308—♀—11.25 x 17.00 x 5.40 x 4.90. Apr. 30, Hidalgo.
309—♂—12.00 x 18.00 x 5.75 x 5.50. Apr. 30, Hidalgo.
370—♂—12.00 x 18.25 x 5.65 x 5.50. May 5, Hidalgo.

MELOPELIA LEUCOPTERA, (*L.*) *Bp.—White-winged Dove.*

In all wooded districts on the Rio Grande above Brownsville, this Dove is abundant. In the immediate vicinity of Brownsville I did not meet with it; but I had not gone far up the river by boat before I saw it in company with others about the banks and shores of the river. Whether at rest or on the wing, it is a handsome bird, showing almost as far as you can see it the characteristic wing-patch which gives it name. These birds are very affectionate and attentive toward each other, and their soft, sweet cooing is pleasant to hear. They are not under foot as much as the Carolina Dove, yet they are by no means shy. I have frequently been within twenty-five feet of them, and stood, to be curiously observed by them, for some seconds before they took flight. Though not as shy in the trees as the Red-billed Pigeon, yet they do not like one to come near their eggs. When I reached Hidalgo, these birds were in pairs, and I was quite surprised on the 1st of May to see a flock of a dozen or so. They were probably males in search of food, while their mates were incubating their eggs, for at that time no young birds were out. I found numbers of their nests situated in all sorts of trees (the mezquite is a favorite tree with them), and in thickets at all heights within from four to ten feet from the ground. They are generally composed of sticks and weeds, with little, sometimes no lining, of leaves or feathers. I have one nest of Spanish moss. The complement of eggs is two. They are oblong-oval, and of a creamy-white; occasionally a set will be very dark cream, or one again will be pure white. Of thirty eggs, the largest is 1.30 by 0.92, and the smallest 1.10 by 0.90, although there is one narrower, it being 1.20 by 0.86. The average size is 1.20 by 0.89.

225—♂—12.00 x 19.25 x 6.25 x 4.25. Apr. 18, Hidalgo.
227—♂—12.25 x 20.00 x 6.50 x 4.40. Apr. 18, Hidalgo.
228—♂—12.00 x 19.00 x 6.40 x 4.40. Apr. 18, Hidalgo.
258—♂—12.25 x 20.00 x 6.50 x 4.50. Apr. 20, Hidalgo.
259—♂—12.10 x 20.00 x 6.60 x 4.50. Apr. 20, Hidalgo.
268—♀—11.75 x 20.50 x 6.60 x 4.25. Apr. 24, Hidalgo.
310—♂—12.00 x 19.75 x 6.25 x 4.50. Apr. 30, Hidalgo.
335—♀—11.50 x 19.50 x 6.00 x 4.00. May 2, Hidalgo.

CHAMÆPELIA PASSERINA, (*L.*) *Sw.*—*Ground Dove.*

In the vicinity of Brownsville, I saw a few small flocks, but not where I could obtain any. At Hidalgo, I saw them occasionally in pairs, and they breed all along the Lower Rio Grande, but I did not collect any of their eggs. The officers at camp near Hidalgo said they came in the mornings to the river, near by, to drink with other Pigeons. I am indebted to Dr. Merrill for a set of two eggs, taken near Brownsville. They are oval, pure white, and measure 0.87 by 0.63 and 0.88 by 0.65.

244—♀—6.75 x 10.85 x 3.50 x 2.25. Apr. 19, Hidalgo.
384—♂—7.00 x 11.50 x 3.40 x 2.50. May 7, Hidalgo.
385—♀—7.00 x 11.50 x 3.40 x 2.40. May 7, Hidalgo.

[Genus ÆCHMOPTILA, *Coues.*

Peristera, of some authors.

Leptoptila, Swainson, Class. B. ii. 1837, 349 (misspelled "*Leptotila*"). (Not *Leptoptilos* Lesson, Tr. Orn. 1831, 585, nor *Leptoptilus* Strickl. 1841, nor *Leptoptila* Gloger, 1842.)—Bp. Consp. Av. ii. 1854, 74.—Gray, Handl. ii. 1870, 242, n. 2319 ("*Leptotila*").

CH.—First primary abruptly emarginate, attenuate and linear near the end. Wings of moderate length: 3d and 4th primaries longest; first shorter than 7th. Tail much shorter than the wings, rounded, of 12 broad feathers. Tarsus entirely naked, equalling or rather exceeding the middle toe and claw. Lateral toes nearly equal, the ends of their claws reaching about opposite the base of the middle claw. Hind toe shortest of all, but perfectly incumbent. Bill small and slender, much shorter than the head.

A considerable naked space about the eye, thence extending in a narrow line to the bill. Size medium or rather small. Body full and stout. Coloration subdued, but hind head and neck iridescent. No metallic spots on wings.

Type, *Æ. jamaicensis* (L.).

This genus comprehends a number of species of Middle and South America and the West Indies, one of which, *Æ. albifrons*, before only known from Mexico, I recently had the pleasure of introducing into our fauna, upon specimens secured by Mr. Sennett, at Hidalgo, Texas. Other species, as recognized by Bonaparte in 1854, are *Æ. verreauxi* of New Granada, *Æ. erythrothorax* of Cayenne, and *Æ. dubusi* from the Rio Napo. G. R. Gray, in 1870, records, as additional species of the same immediate group, *Æ. rufaxilla*, *Æ. brasiliensis*, *Æ. cerviniventris*, *Æ. plumbiceps*, *Æ. cassini*, *Æ. riottei*, and *Æ. ochroptera*.

The characters of the genus are drawn up from *Æ. albifrons*. The group is closely related to *Peristera* proper, of which Gray makes it a subgenus. It was originally named *Leptotila* by Swainson in 1837, but the name is preoccupied, having been used in 1831 by Lesson, under the form *Leptoptilos*, for a genus of Storks. Difference of termination may suffice to distinguish any two names when indicating any difference of meaning, as in the cases of *Picus* and *Pica*, but can hardly be considered sufficient in this instance, especially as the original form of the word, *Leptoptilos*, requires to be corrected into *Leptoptilus* or *Leptoptila*, as has already been done by Strickland and Gloger.

Æchmoptila includes a number of species of "Ground Doves", related to such forms as *Zenaida*, *Peristera*, *Oreopelia*, &c., distinguished from the more arboreal Pigeons of the New World by their long naked tarsi. They are of rather small size, stout, full body, small bill, short, rounded broadly, 12-feathered tail, and have the first primary abruptly linear-attenuate at the end for an inch or so. They are of rather plain colors, though the neck has the iridescence so common in Pigeons, and usually have the lining of the wings chestnut.

ÆCHMOPTILA ALBIFRONS, (*Bp.*) *Coues.—White-fronted Pigeon.*

Leptoptila albifrons, Bp. C. A. ii. 1854, 74. (Mexico; "Cuba".—Lawr. Bull. Nat. Mus. n. 4, 1876, 44 (Tehuantepec). Iris orange; bill black; orbital space bluish; feet carmine.)—Coues, Bull. Nuttall Club, ii. n. 3, July, 1877, 82 (Hidalgo, Texas, May, 1877, G. B. Sennett).

Peristera (*Leptotila*) *albifrons*, Gray, Handlist, ii. 1870, 242, n. 9380.

CH. SP.— ♂ *brunneo olivacea sericea, cervice cupreo-purpurascente, fronte albescente; subtus albido, lateribus obscurioribus, pectore juguloque subvinaceis, crisso et mente albis; tectricibus alæ inferioribus axillaribusque castaneis; rectricibus mediæ dorso concoloribus, cæteris nigrescentibus apicibus albis; rostro nigro; pedibus ruberrimis; spatio orbitali livido-incarnato. Long. tot. pedalis; alæ semipedalis; caudæ* 4½: *rostri* ⅝: *tarsi* 1¼–1½. *dig. med. cum ungue* 1⅓.

♂, adult: Upper parts brownish-olive, with silky lustre (much as in *Coccygus americanus* for example). Hind head, nape, and back and sides of neck with coppery purplish iridescence. Top of the head of a somewhat bluish or glaucous "bloom", fading to creamy-white on the forehead. Under parts dull white or whitish, more or less shaded with olive-brown on the sides, deepening on the fore breast and jugulum to pale vinaceous; belly, crissum, and chin quite purely white. Wing-coverts and inner quills like the back, and without metallic spots; other larger remiges slaty-blackish, with very narrow pale edging toward the end. All the under wing-coverts and the axillaries bright chestnut. Two middle tail-feathers like the back; others slaty-black, tipped with white in decreasing amount from the outer part inward, the largest white tips being about half an inch in extent. Bill black. Feet carmine-red. Iris yellow. Bare skin around eye red and livid blue. Length 12–12½; extent 19–19½; wing 6–6½; tail 4¼–4½; bill ⅝–¾; tarsus 1¼–1⅓, middle toe and claw rather less.

Female not seen.—E. C.]

Shortly after obtaining my first specimen of this Dove, I sent a description of it to Washington. It was identified, and a portion of the letter published in the Bulletin of the Nuttall Ornithological Club for July, vol. ii., No. 3, p. 82. Since then I obtained more birds, and will here give a further description of it and its habits. On April 18th, I obtained my first in a tract of timber a mile below Hidalgo, near the bank of the river. It was shot from the upper branches of the tallest trees. Scattered about the woods in pairs were *Columba flavirostris*, Red-billed Pigeon, and *Melopelia leucoptera*, White-winged Dove. On the 19th, another was shot in the same locality. Five specimens were secured up to the time of leaving, and a number of others seen and heard. It is more secluded than the other Pigeons, and only found among the tallest timber. Seen in the woods, it resembles *M. leucoptera* both in size and shape of tail, but can be recognized from it at sight by the absence of the large, white wing-patch. Its note is somewhat prolonged, ends with a falling inflection, and is exceedingly low in pitch. Most of my birds were obtained by following the sound of their notes until within range; all were seen sitting quietly in secluded places; all are males, and injured considerably by falling from great heights. On the last day of my stay at Hidalgo, I watched a pair for a long time, in hopes of finding their nest, but without success. If they had one, they were evidently not anxious to get to their eggs. From their actions, I am sure they were mated. I was anxious to get the female, but, as I could not distinguish it from the male, I had to take the chances; and upon shooting one, the other flew out of sight, and I could not obtain it. Now, that the bird is known to be on our border, we shall soon know all about its breeding habits.

This species has the following specific characteristics:—Upper parts greenish-olive, the metallic coloring purple, with bronzy-green reflections, and restricted to the back of neck. Crown drab, shading to nearly white on forehead. Orbital space small, faintly red and blue. Chin white. Foreneck creamy-slate. Belly white. Sides ashy. Wings brown above, slaty below, and whole under wing-coverts bright chestnut, which color extends even to the sides. Tail square, of twelve feathers; middle ones olive, like the back, and the others brown above and tipped with white in increasing amount until the outer ones are white for half an inch. Tail below black, with the white tips as above. Under tail-coverts pure white. Iris yellow, with reddish-brown shade when fresh, but changing after death to a deep salmon. Bill black, 0.62 to 0.70 of an inch. Feet carmine. Tarsus 1.35; middle toe and claw the same.

224—♂—12.50 x 19.50 x 6.40 x 4.50. Apr. 18, Hidalgo.
234—♂—12.50 x 19.25 x 6.25 x 4.50. Apr. 19, Hidalgo.
334—♂—12.25 x 19.00 x 6.00 x 4.50. May 2, Hidalgo.
421—♂—12.00 x 19.25 x 6.00 x 4.25. May 11, Hidalgo.

CRACIDÆ.

ORTALIDA VETULA, *Wagl.—Texas Guan.*

This curious and interesting bird is well described in "North American Birds"; but I must take issue on a few points, particularly in regard to its breeding habits. In the vicinity of Brownsville, the heavy timber being scarce, I saw none, and only heard them a few times in the heaviest chaparral. Hidalgo is in the very heart of their habitat within our limits, and my facilities for observing them at that point were very good indeed. Mornings and evenings we could hear them from every direction, and whenever we went into the woods they were always observed. One is sure to find them where dense thickets of undergrowth are under large trees. At the time I was with them they were in pairs, and generally a number of pairs would be in one locality. The sexes are similar in appearance, and their notes alike, excepting that the female's note is pitched higher. Its notes are loud and simply indescribable. If you will sound the word cha-cha-la-ca in rapid succession in the loudest possible whisper, always accenting the last two syllables, you will give to yourself, but to no one else, some idea of their love songs. The loudness and hoarseness are the same in both sexes, and one answers the other so closely that it is hard to distinguish their notes, although one may be closely observing them. Their concerts take place mornings, evenings, and at all hours on dark days. They are at such times in the tops of the trees, and, if alarmed, at once give the warning note, and sail, with spread wings, down into the thickets, becoming instantly quiet. The woods which a moment before resounded with a deafening noise of an uncertain number of these birds (it is impossible to judge by the sound whether few or many are engaged in their concerts) is now still as death. Those unobserved and farthest off will, when they feel reassured, start up their cry, and set the whole company to screaming again. Several times, when well concealed, I have noticed a pair spring from a thicket into a large tree, jump from limb to limb close to the body until they reached the top, when they would walk out to the end of the branch and begin their song. They roost in trees, and hunters frequently get them at night. Rarely did I see them on the ground. Once, while resting in a mezquite grove, which looked very much like a peach-orchard on a well-kept lawn, I saw a Chachalaca trot out from a neighboring thicket in full view. He seemed looking for food on the ground. He discovered me, and we eyed each other for a moment, when it turned, ran a short distance, sprang into the lower branches of a tree, and, hopping along from tree to tree, disappeared into the thicket about five feet from the ground. They are very fond of blackberries, which were then getting ripe. Another peculiarity of this bird is that the male alone has the trachea doubled over some three or four inches on the muscles of the breast, directly under the skin. Their meat is white, and most excellent eating. Of their crossing with the common game fowl, and thereby producing the superior fighting-cocks for which the Mexicans are so noted, I saw no proof, but it is accepted as true by everybody in the region. They are easily domesticated. I saw a pair in a jacal at Brownsville that could hardly be driven out of doors long enough for us to see them.

The nest of this species is never found on the ground, but in trees and bushes varying in height from four to ten feet. The structure varies in composition and size according to its location. If it is in a large fork close to the body of the tree, a few sticks, grasses, and leaves are sufficient, and the structure will not equal in size or strength that of a Mockingbird. This small size is by far the most frequent; but I have a nest built upon a fork of two small branches, composed entirely of Spanish moss. It is bulky and flat, being a foot in diameter and four inches deep, with a depression four inches wide and two deep. The bird begins to lay about the middle of April, and when I left that section on May 11 chicks were peeping in the eggs, and some nests were found with broken shells and deserted. The birds are clean in their habits, no excrement or litter being found in their nests. The most natural place for them to build is in the undergrowth or thickets in the dense forests. Their complement of eggs is three. I secured sixteen sets, and in no instance were there more, and only twice less. In no instance were they covered with leaves or anything else, as has been said. Nor does the parent fly at the intruder or show any alarm. On the contrary, as soon as she is observed, she darts into the thickets, as usual, without any note of alarm or any show of fighting. More often, the bird flies off before she has a chance of being seen, and the eggs can be seen as far as you can see the nest. The first nest was found April 20, and contained its full complement of three eggs. The location was above the camp in a wesatche tree, close by a bridle-path, used almost daily by the cavalry in going to practice. The nest was some eight or nine feet above the ground, in a crotch, and would not have been noticed had not the bird flown as we came upon it while on horseback. This was by all odds the most exposed place in which any nest was found. One nest I found in the heart of the woods at Lomita Ranche, and the three eggs were so much exposed that they were seen some time before the nest could be distinguished. This nest was shallow, as a Pigeon's, and situated about six feet from the ground on two small branches of a sapling. To describe other nests would be but repetition.

The eggs are remarkably large in proportion to the size of the bird's body. They have very thick shells, resembling in this respect a Guinea-fowl's egg, and of extreme hardness. Their shape is oblong-oval. They are distinctly granulated and of a rich creamy-white. They are generally remarkably clean. They are also very even in size. The largest measures 2.45 by 1.65, the smallest 2.31 by 1.55, and the average 2.34 by 1.60.

226—♂—22.00 x 24.50 x 7.50 x 9.50. Apr. 18, Hidalgo.
269—♂—23.00 x 26.50 x 8.50 x 10.50. Apr. 24, Hidalgo.
270—♀—21.50 x 25.00 x 8.00 x 9.00. Apr. 24, Hidalgo.
271—♂—24.00 x 27.00 x 8.50 x 10.50. Apr. 24, Hidalgo.
311—♂—23.50 x 28.00 x 8.15 x 10.00. Apr. 30, Hidalgo.

MELEAGRIDÆ.

MELEAGRIS GALLOPAVO,[*] *L.—Turkey.*

This fine game bird is common in the timber districts along the Lower Rio Grande. While going up and down the river on the steamer, I frequently saw them on the flat bars that make out in the bends of the river, or flying from one side to the other. In the vicinity of Hidalgo, I heard them frequently, and saw them occasionally. I took no especial pains to hunt them, and obtained no specimens. On May 8th, at the camp, I saw a number of young just from the egg that the soldiers had caught in the neighborhood.

PERDICIDÆ.

ORTYX VIRGINIANA TEXANA,[†] (*Lawr.*) *Coues.—Texas Quail.*

I frequently met them, singly or in pairs, in open chaparral. I shot a number, and obtained three sets of eggs. I can see no difference in habits from *O. virginiana*, and their eggs are similar but smaller. They average 1.20 by 0.93.

93—♀— 9.00 x 14.25 x 4.25 x 2.50.	Mar. 27, Brownsville.
142—♂—10.00 x 14.50 x 4.40 x 2.75.	Apr. 3, Brownsville.
352—♀— 9.50 x 14.25 x 4.00 x 2.40.	May 3, Hidalgo.
353—♂— 9.50 x 14.65 x 4.15 x 2.50.	May 3, Hidalgo.
369—♂— 9.75 x 14.50 x 4.15 x 2.50.	May 5, Hidalgo.

Having come to the water birds, I will preface these notes by saying that I omit mentioning many species that are well known to exist on our Southern border only in winter, and of which I did not obtain specimens. From the 28th of February until the 20th of March we were principally among the water birds. The birds of the North were moulting, and those from Mexico were just coming in, were paired, and busy prospecting for proper places for their eggs. We found no eggs on our way down the coast.

CHARADRIIDÆ.

ÆGIALITIS VOCIFERA, (*L.*) *Cass.—Kildeer Plover.*

This bird was abundant everywhere near the coast, and at Brownsville in wet places, up to April 15th, when I left for up the river. On my return, I do not remember of seeing it.

HÆMATOPODIDÆ.

HÆMATOPUS PALLIATUS, *Temm.—Oyster-catcher.*

We met this bird in the bayous between Padre and Mustang Islands, in Corpus Christi Pass, on March 12th. They were in pairs, and continually making swift aërial flights, common to shore birds in the mating season. Here, among the immense oyster-beds, they revelled in plenty, and were as tame as could be. We shot a number, and they were so very fat that little could be done with them. Dissection showed eggs of half size, so that if we had had time to remain even a week longer, we undoubtedly could have found their eggs.

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[*] [No specimens examined by me. The Turkey of this region is said to have light-tipped upper tail-coverts, being thus referable to true *gallopavo* (*mexicana* Gould).—E. C.]

[†] [Specimens typical of this subspecies.—E. C.]

33—♀—20.00 x 37.00 x 11.00 x 4.75. Mar. 13, Padre Island.

STREPSILAS INTERPRES, (*L.*) *Ill.—Turnstone.*

I am satisfied that many of this species breed along the entire coast of Texas. At Point Isabel, on May 19th, I saw many pairs, and by their actions they had evidently settled for the season. I could not drive them away from certain localities. I was told by the fishermen that the birds were there all the year round. I did not find their eggs.

RECURVIROSTRIDÆ.

RECURVIROSTRA AMERICANA, *Gm.—Avocet.*

At Bolivar Point, on Galveston Bay, March 1st, I found this bird in immense flocks. They were very shy, and it was only by the most careful manœuvring that I could shoot them. They were then just casting off their winter plumage. March 29th, on the salt-marshes about halfway between Brownsville and the mouth of the Rio Grande, I met them again, in flocks of three or four. Here they exhibited nothing like the shyness we had seen on Bolivar Point. After shooting at them, they would fly a short distance along the shallow lagoon, and drop down and commence feeding again. They apparently felt no concern for their wounded companions. They were not yet in summer plumage. On May 20, I examined miles of the bayous, lagoons, and marshes about Point Isabel, fit places for them, and did not see any of this species, and I presume they had left for the North and West.

112—♀—17.50 x 30.50 x 9.00 x 3.50. Mar. 29, Brownsville.

HIMANTOPUS NIGRICOLLIS, *V.—Stilt.*

Occasionally seen about Brownsville in small flocks. In the marshes near the coast I found them numerous, and breeding on a small island that rose just above the water's edge. To reach it, we waded to the depth of a foot, for half a mile or more from our ambulance, and so low was it that it was quite concealed by the sparse grass of the marsh about it. The island was several hundred feet long by about two hundred feet wide, and was composed of mud and grasses. Herons of all kinds were seen scattered over the whole marsh, feeding or lazily flying about. The nests were near the water, and some of them in the water. Those in the water were composed of grasses, piled up in little heaps of such a height that the eggs would just clear the water. If built on the mud, there were fewer grasses. The birds were there in numbers, screaming about our heads. No other birds were breeding on the island, excepting

Marsh and Forster's Terns, the nests of each being in separate groups. They evidently had but fairly commenced laying, as, out of the dozen or more nests, we found only one had its full complement of four eggs. All were fresh, excepting a clutch of four, which contained young nearly ready to come out of the shell. We were only restrained from taking many of the birds by having our bag already so full that the idea of taking care of any more in the great heat was appalling. The eggs have a ground-color of greenish-drab, and are blotched with dark brown, the spots being thickest about the greatest diameter. The largest egg measures 1.85 by 1.25, the smallest 1.60 by 1.15, and the average 1.71 by 1.21.

436—♂—15.50 x 26.00 x 9.00 x 3.00. May 16, Brownsville.

SCOLOPACIDÆ.

TRINGA MACULATA, *V.—Pectoral Sandpiper.*

Great numbers of these were on the Rio Grande, in company with *Actiturus bartramius*, up to about April 15th, after which time I did not notice them.

96—♂—9.50 x 18.50 x 5.75 x 2.50. Mar. 27, Brownsville.
97—♀—8.25 x 16.00 x 5.15 x 2.50. Mar. 27, Brownsville.

LIMOSA FEDOA, (*L.*) *Ord.—Great Marbled Godwit.*

The only locality in which we noticed this species was at Padre Island, by Corpus Christi Pass, about March 15. They then had their warm winter plumage. A number were shot, but none preserved.

TOTANUS SEMIPALMATUS, *Gm.— Willet.*

I saw these every day on the coast as we were going down, and, March 29th, I saw them again near the mouth of the Rio Grande. When I found the Stilt's eggs, on May 16th, I saw them in pairs, scattered about; and on May 19th, at Point Isabel, I saw several pairs. I have just received a letter from Dr. Merrill, saying that he found a set of their eggs not far from where we found the Stilt's eggs, but giving no further particulars.

TOTANUS MELANOLEUCUS, *Gm.—Greater Telltale.*

At Point Isabel, on May 19th, I shot this bird, and saw several pairs, apparently settled to breed.

ACTITURUS BARTRAMIUS, (*Wils.*) *Bp.—Upland Plover.*

Seen in abundance near the coast, and in wet places near Brownsville, up to April 15th, after which time I did not frequent its favorite localities.

95—♂—11.50 x 21.50 x 6.50 x 3.50. Mar. 27, Brownsville.

NUMENIUS LONGIROSTRIS, *Wils.—Long-billed Curlew.*

I saw this conspicuous bird along the coast going down, and in the marshes near Brownsville, up to the time of taking the steamer for home; and I have no doubt a few remain near the coast, about the mouth of the Rio Grande, the entire year.

NUMENIUS BOREALIS, (*Forst.*) *Lath.*—*Esquimaux Curlew.*

On March 8th, at Corpus Christi, near the mouth of the Nueces, I shot several of these birds. They were seen singly or in groups of three or four. On the northern end of Padre Island, a week later, I saw them in flocks of twenty or more. They were seen alighting on the small islands in the pass, and flying swiftly along the margins of the water. They were quite shy; a number were shot.

22—♂—13.75 x 27.00 x 8.50 x 3.40. Mar. 28, Corpus Christi.

TANTALIDÆ.

FALCINELLUS GUARAUNA, *Gm.*—*White-faced Glossy Ibis.*

My experience with the breeding habits of this beautiful bird was unexpectedly large and opportune. On my return to Brownsville from up the river, a hunter brought me, among others, a young bird and some eggs, that I had never seen before, and which, he said, belonged to this bird. The next day, May 15th, I took an ambulance and driver, and this same Mexican hunter, to compel him to make good the stories he had told of the great numbers of birds and eggs to be seen. Down we went, through the chaparral, across the country, by the borders of lagoons and lakes, until we stopped on the edge of an immense salt-marsh, filled with rushes excepting near the shores. All kinds of Herons and water fowl were moving about in all directions, but nothing unusual was seen, there being no indications of an established heronry. When the Mexican stripped and said, "Come on," I dared not back out, and could but do the same, and follow with the gun. The darky driver fairly rolled with laughter, and considered it a good joke. I must say, at that moment I agreed with him. In we went, my leather-colored guide taking the lead, with my big bag strapped to his head and shoulders. The rushes were distant many rods from the shore, in water from three to four feet deep, and stood out of the water about six feet. As we parted the rushes to examine a few nests near the outskirts, a few Herons and Ibises circled and screamed above our heads. I indicated to my guide that I would not shoot until I found an Ibis on its nest. Into the rushes we worked our way, the nests grew more abundant, and we came to openings that would allow us to have a more extended view. I here picked out an Ibis on a nest, fired, and saw the bird drop over; but I was so completely overwhelmed by the sight above and about us, that I was for the time transfixed. A hundred acres of beautiful birds, plunging and screaming above the rushes! Just think of it! In ten minutes from the report of the gun, all the thousands of birds, excepting those in our immediate vicinity, were settled again upon their eggs. On every side were nests in great numbers, and birds guarding their eggs or young, allowing us to get within a few feet of them before launching into the air with flapping wings, legs, and necks. The Ibis alone was shy, and kept at a respectful distance. Along with it, and in about equal numbers, were *Ardea egretta*, Great White Egret; *Ardea candidissima*, Little White Egret; and *Ardea* var. *leucoprymna*, Louisiana Heron; besides not a few *Nyctiardea* var. *nævia*, Night Heron. All of these were here nesting indiscriminately. After shooting a few birds, I soon found that the Ibis eggs resembled none of the others. Its nest differs considerably from those of the Herons nesting near, although built of the same material. It is built of dead rushes twined about broken-down and upright living ones, and is more elaborately and strongly woven, and is deeper than the others. Its shape is not unlike that of a Grackle's nest. Its outside is about a foot in diameter and eight or ten inches deep, and inside six or eight inches wide by three or four inches deep. Its height from the water varied from two to four feet. There is greater variation in the season for breeding with this species than with the Herons. I found larger younger birds, and fresher eggs. The season for fresh eggs, however, was drawing to a close, for few indeed were the nests found containing one or no egg. Unlike the Herons, too, the whole clutch would be hatched at nearly the same time; *i. e.*, the eggs of the clutch would be more equally advanced, and the young nearly of a size. I found young in all stages, from those just out of the egg to those half-grown and about ready to leave the nest. The latter, at our near approach, would scramble out of the nests and into the water, and a tough chase we would have in the tangled reeds to catch them. The young, as it leaves the egg, is covered with black down, with a white patch on the head; its legs and bill are pink, the latter decurved, and with two black bands. As it grows, the quills and feathers show, from their start, the metallic hues, and when half-grown, it is of the richest deep green. Neither old nor young make any noise or resistance when captured.*

Eggs were found in all stages of incubation. The proportion of eggs with young was largely in excess of the fresh ones, yet I found enough of the latter. I could tell them by the color—the fresher the egg the deeper the green. It would not be exaggeration to say that I could have gathered bushels of eggs and hundreds of young of this species alone. The farther we penetrated into the rushes, the more abundant were the nests. Such a haul was only equalled on the very next day, May 16th, when Dr. Merrill accompanied us, and we were among these beautiful Ibises nearly the whole day. Here, too, other birds, of which notice will be taken farther on, were found breeding. In this heronry and marsh, we worked long and faithfully, hardly knowing what we would not find breeding in it. It was near night both days before I left it, and toward evening large flocks of this Ibis would come in to roost, probably having been off in search of food during the day. Their flight is in lines, like the Cormorants, and well sustained. This bird is a market bird in the fall, when it is fat and said to be very good. The complement of eggs is three or four; in only one instance did I find five. Of the seventy-six eggs before me I give the following description:— Shape oblong, rounded at one end and pointed at the other. In only a few instances are they oval. Color bluish-green. The longest and broadest egg measures 2.20 by 1.50; the shortest and narrowest, 1.72 by 1.30; and the average, 1.99 by 1.42.

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* [Mr. Sennett's beautifully prepared and high-plumaged specimens show very clearly the specific distinction from the common Bay or Glossy Ibis, *Falcinellus igneus* of authors. The young birds are entirely green, and represent the supposed species, *Falcinellus thalassinus* of Mr. Ridgway, who informs me that he some time since arrived at this determination.—E. C.]

430—♂—23.00 x 38.00 x 11.00 x 4.00. May 15, Brownsville.
431—♂—23.50 x 38.50 x 10.75 x 4.00. May 15, Brownsville.
435—♀—21.50 x 36.00 x 10.25 x 3.75. May 16, Brownsville.
437—♂—24.00 x 38.00 x 10.00 x 4.00. May 16, Brownsville.
439—♂—24.50 x 38.50 x 10.50 x 4.00. May 16, Brownsville.
440—♂—23.50 x 39.50 x 10.75 x 4.25. May 16, Brownsville.
443—♂—23.50 x 38.50 x 11.00 x 3.75. May 16, Brownsville.
445—♂—23.75 x 38.75 x 10.60 x 3.75. May 16, Brownsville.

IBIS ALBA, (*L.*) *V.*—*White Ibis.*

The only time and place I saw this bird was on May 16, at the "heronry", where I obtained so many *Falcinellus guarauna.* Not over a dozen were seen, and only one secured. I looked long for their nests, but I did not find any to know them. The birds did not act as if they had nests, but possibly they were nesting in the heart of the rushes.

441—♂—27.25 x 33.75 x 11.50 x 4.50. May 16, Brownsville.

PLATALEA AJAJA, *L.*—*Roseate Spoonbill.*

But little was seen of this magnificent and wonderful bird. A few miles from the coast it is known to frequent the salt lakes and marshes. In going from Brownsville to Point Isabel on the cars, I saw a flock of eight in full plumage, as they were startled by our train. While taking a run on horseback about the lagoons and marshes in the vicinity of Point Isabel, on the evening before my departure for home, I saw a few flying over the marshes, but got no shot. I could learn nothing about their breeding habits, although everybody in that section of country mentions seeing them often, and speaks of them as very shy.

ARDEIDÆ.*

ARDEA HERODIAS, *L.*—*Great Blue Heron.*

About the lagoons, inside of the sand-hills on the coast, and especially about Corpus Christi Pass, this bird was seen in numbers. On the northern end of Padre Island I saw them by hundreds. Nearly all the bushes of the island that grow to the height of a man are located on that point, and in the largest of the growth the camp of the Coast Survey was situated. All of this growth could be seen from the station.

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* [Nomenclature in this family according to Mr. Ridgway's later investigations—see his paper, this Bulletin, beyond.—E. C.]

On March 15th, Mr. Halter and I, with a glass, counted thirty-eight of this species on one clump of bushes no larger than two hundred by twenty-five feet. They were busy at work on their nests, and had them all nearly ready for the eggs. On the same day, I examined these bushes, which were scruboak and about eight feet high. By going to the top of a sand-hill, which had drifted upon one of these clumps, I could look into nearly all of the nests, and, had I been inclined, could have stepped into several of them. No eggs were yet laid. The nests were composed of sticks laid upon the thick, tangled bushes. They were very bulky, some being fully three feet in diameter, and had a depression of about six inches. The birds were in fine plumage, very shy, knew well the range of a gun, and had sentinels on every sand-hill. When a man appeared, the whole army within the radius of a mile were signalled to that effect. A set of their eggs was sent me, that was obtained soon after I left. They average 2.58 by 1.84 inches.

HERODIAS EGRETTA, (*Gm.*) *Gray.—Great White Egret.*

Frequently seen about the lagoons on the coast, and also on the river between Hidalgo and Brownsville. At the great heroury in the rushes, about half-way between Brownsville and the coast, I found it breeding in great numbers, and obtained eggs and young. When I found them, May 15th, the eggs were mostly hatched, and not a perfectly fresh egg was to be found. Young nearly as large as a Gallinule and eggs not hatched were in the same nest. The birds were not easily frightened from their nests, but would stretch up their long necks, and eye us until we were within a few feet of them before throwing themselves into the air. The young are covered sparsely with white down. Their nests are bulky, composed of the dead and broken-down rushes, about two feet in diameter, and situated from one to three feet above the water. Their complement of eggs is three or four. The eggs are broadly oval, of a pale greenish-blue color, and average 2.18 by 1.57 inches.

200—♂—41.50 x 61.00 x 17.00 x 6.65. Apr. 10, Brownsville.
201—♀—38.00 x 56.00 x 15.00 x 5.50. Apr. 10, Brownsville.

GARZETTA CANDIDISSIMA, (*Jacq.*) *Bp.—Little White Egret.*

On May 15th, I was delighted to meet with this to me the prettiest of all the Herons in the salt-marshes, where it was breeding in innumerable numbers in company with others of the family. I obtained numbers of birds, eggs, and young. It builds a flat nest of rushes, about eight or ten inches in diameter, with a depression of about three inches, and it is supported by broken-down, living reeds at a height above the water of from six inches to three feet. The young fresh from the egg are covered well with white down, and when a few days old are very pretty, compared with young Herons. When I found them, the young were just hatching, and but few full families were out. The young do not vary as much in size as do *A. egretta*, Great White Egret. The eggs and nests are so near like those of *A. leucoprymna*, Louisiana Heron, that the birds must be well marked, or shot on the nest, to be sure of their identification. Both kinds breed there side by side, in equal numbers, and, fortunately, both are quite tame, so that one can approach carefully under the rushes to within a short distance, and can mark and follow the birds. I obtained many fresh eggs of this bird, and but for preferring Glossy Ibis, and having all the load we could manage for a rough road home, I should have taken more. The complement is four. The eggs are oval, of a pale greenish-blue, and average 1.66 by 1.25 inches.

427—♀—23.25 x 37.00 x 9.50 x 3.50. May 15, Brownsville.
428—♀—23.00 x 36.00 x 9.85 x 3.25. May 15, Brownsville.

HYDRANASSA TRICOLOR, (*Müll.*) *Ridgw.—Louisiana Heron.*

This Heron was not noticed until I found it breeding, May 15th, in the rushes of the salt-marshes between Brownsville and the coast. Its nest and eggs are so similar to those of *Ardea candidissima*, that one description will answer for both. What little difference I find in the shape of the eggs is, that those of this species are rather longer and more pointed on an average. I have found, however, well identified eggs of each that cannot be told apart. The nests contained young of all ages up to one-fourth size; and I found about the same variation in the same clutch as I did in *A. egretta*, Great White Egret. Perfectly fresh eggs were very scarce in hundreds of nests examined. Four eggs are generally laid. The old birds were bold, and the contrast in colors made them look fine as they circled about our heads. The shape of the eggs is oblong-oval, and the color, like most of the Herons, a pale greenish-blue. They average 1.78 by 1.29 inches.

425—♀—26.25 x 38.00 x 9.65 x 3.15. May 15, Brownsville.
426—♂—26.50 x 39.00 x 10.50 x 3.75. May 15, Brownsville.
427—♂—26.50 x 38.00 x 10.00 x 3.50. May 16, Brownsville.
434—♀—25.75 x 37.50 x 9.75 x 3.25. May 16, Brownsville.

DICHROMANASSA RUFA, (*Bodd.*) *Ridgw.—Reddish Egret.*

I only observed this Heron on the islands and lagoons, near Corpus Christi Pass, in the middle of March. Both the adult and white young were shot. The proportion seemed to be largely in favor of the adult plumage. They were not at all shy. I have seen them alight on the oyster-beds, within range of me, when I have been in a rowboat, and they would let me approach within easy gunshot range before they would discontinue feeding or searching for food. They were exceedingly fat, more so, I think, than the Oyster-catchers. These and the Great Blue Herons were seen feeding together, and a few others of the family at this particular place. I was too early for their eggs, but since my return I have received a set from there without any particulars. Their shape is long-oval and color pale greenish-blue. They average 2 by 1.47 inches.

34—♀—27.50 x 46.50 x 12.50 x 4.50. Mar. 14, Padre Island.

FLORIDA CŒRULEA, (*L.*) *Bd.—Little Blue Heron.*

I shot a single specimen of this species a few miles from Brownsville, and only saw two or three others in the same locality.

107—♀—23.50 x 41.00 x 11.50 x 4.50. Mar. 29, Brownsville.

NYCTIARDEA NÆVIA, (*Bodd.*) *Allen.—Night Heron.*

Heard at night, as we were going down the coast, but not seen until we came upon the heronry in the salt-marshes between Brownsville and the coast. There I found it breeding, not in such numbers as others of the family, but still common. The nests were bulky affairs, composed of the dead rushes, and placed near the water on broken-down and living rushes. Nearly all contained young, but I secured a set of three very fresh eggs. The old birds were exceedingly noisy and bold, and the young pugnacious from their exit from the eggs. They had no idea of leaving the nest at my approach, but, instead, would strike out at my hands, and, even when caught, would not cease to fight. Their nests were more filthy than the others; the young are half-naked, and a miserable, vagabond-looking set they are. The usual number of eggs is four. Their color is bluish-white and shape very broadly oval. Their average size is 1.94 by 1.52.

NYCTHERODIUS VIOLACEUS, (*L.*) *Reich.—Yellow-crowned Night Heron.*

Several were observed in swamps and thickets on Nueces Bay, near Corpus Christi, on the 8th of March. None were obtained, however, as they were shy and the thickets too difficult to penetrate.

ARDETTA EXILIS, (*Gm.*) *Gr.—Least Bittern.*

Occasionally seen about the marshes. I shot one and saw others at the great heronry, near Brownsville, on May 16th. I did not find its nest, but I am confident it breeds there.

438—♂—14.25 x 18.25 x 4.60 x 1.90. May 16, Brownsville.

GRUIDÆ.

GRUS AMERICANA, (*L.*) *Ord.—White Crane.*

I frequently saw these noble birds of the prairies feeding in the lagoons, as we went down the coast, and in the wet places about Brownsville, up to about April 1st. They were always in pairs, and, as usual, very shy.

RALLIDÆ.

RALLUS LONGIROSTRIS, *Bodd.—Clapper Rail.*

A few of this species were seen about Galveston only, and a single bird obtained.

3—♀—14.60 x 20.00 x 5.75 x 2.50. Feb. 28, Galveston.

GALLINULA GALEATA, (*Licht.*) *Bp.—Florida Gallinule.*

The only place that I was sure of seeing this bird was at the "heronry". Here I saw quantities of them, and it is quite probable that I saw them in company with Coots on the river. When gathering Ibis and Heron eggs, I heard constantly the notes of this bird and *Fulica americana*, and found its nest quite common in the same rushes. Its nest is built of dead rushes, and floats upon the water, moored to the stalks of growing reeds. I took one clutch of fourteen, another of nine, and another of seven, on May 16th, perfectly fresh. In color and markings I see no variation from Florida specimens. They average 1.77 by 1.25.

447—♀—14.00 x 22.25 x 6.75 x 2.75. May 16, Brownsville.
448—♀—14.50 x 23.00 x 6.75 x 2.75. May 16, Brownsville.

FULICA AMERICANA, *Gm.—American Coot.*

Very abundant on the river between Brownsville and Hidalgo; and as our steamer came upon them, instead of flying they would generally paddle to the shore, run up the banks, and hide behind clumps of earth or roots. I found it breeding in about equal numbers with *Gallinula galeata* in the marshes below Brownsville. Sets of thirteen, eleven, and so on down, of fresh eggs were taken. The nests were made of rushes, fastened to the reeds in the densest parts, and floated on the water. The markings of the eggs are no different from Northwestern specimens. They average 1.94 by 1.30.

ANATIDÆ.

ANSER HYPERBOREUS, *Pall.—Snow Goose.*

On March 29th, while near the Rio Grande, about half-way between its mouth and Brownsville, I saw large numbers of this species, and shot one. The were feeding on the immense mud-flats of the marshes, and by the time I reached my bird it was covered with mud. I saw none later than this, although on the coast, earlier, it was frequently observed about the lagoons and marshes.

DENDROCYGNA AUTUMNALIS, (*L.*) *Eyton.—Autumnal Tree Duck.*

This fine Goose-like Duck is not uncommon in suitable places along the Lower Rio Grande. By the inhabitants it is called "Corn-field Duck", from its habit of frequenting corn-fields for the grain, at which times it is a common market bird. At the time of my observations, it was busy breeding, and the few seen were very shy. In going up the river from Brownsville, April 15th, single birds and groups of two or three were met very frequently; but coming down, May 12th, they were much more abundant, gathered in flocks of ten or twelve on the sand-bars. At this time, I think the females were busy sitting on their eggs. I shot but one, and it was lost in the river. I did not come across its nest. Since my return, I received a letter from Dr. Finley, stationed at camp near Hidalgo, stating that he obtained a set of their eggs soon after I left, and that they are extremely difficult to find. He gave no further particulars. He also secured a fine bird for me.

ANAS OBSCURA, *Gm.—Dusky Duck.*

On May 19th, I shot two females of this species near Point Isabel, on the borders of a bayou. Each bird was shot flying alone, and I regret that I did not pay more attention to their dissection, and could not save their skins, for I suspect they were breeding in the vicinity. It was on the eve of my departure, and I had other birds occupying my attention.

DAFILA ACUTA, (*L.*) *Jenyns.—Pintail Duck.*

Only noticed along the coast on our way down, and about the marshes in the vicinity of Brownsville up to April 1st.

CHAULELASMUS STREPERUS, (*L.*) *Gray.—Gadwall.*

Very abundant about Galveston and Corpus Christi Bays in March. Not noticed on the Rio Grande.

MARECA AMERICANA, (*Gm.*) *Steph.—Baldpate.*

Only noticed in the lagoons and bays near the coast, as I was going down.

SPATULA CLYPEATA, (*L.*) *Boie.—Sheveller.*

Common along the river and lagoons in the interior. On April 26th, at Hidalgo, I saw three males and one female resting on a sand-bar, and I obtained all but one male at a single discharge.

FULIGULA AFFINIS, *Eyton.—Lesser Blackhead.*

The most common duck seen on our way down. Corpus Christi Bay was filled with them, and they were so fat they could hardly fly.

PELECANIDÆ.

PELECANUS TRACHYRHYNCHUS, *Lath.—White Pelican.*

These conspicuous birds were seen on and near the coast constantly on my way down, and when I left the mouth of the Rio Grande, on May 20th, they were still there, but in much more limited numbers. Up the river as far as Hidalgo, on May 2d, I saw a flock of twenty-five sail over the town and river. On the evening of May 11th, I shot one from the steamer as I was going toward Brownsville. Near the salt-marshes and the heronry, between Brownsville and the coast, on May 16, they were standing on the shores of the lakes, and at Point Isabel, on May 19, I saw a few. With my glass, I could plainly see that they had crests on the culmen, and, as both sexes have the crests, I should not be suprised to hear of their breeding on our extreme Southern border. In fact, I think it altogether probable. Why not? They breed with Forster's Terns, *Sterna forsteri*, in the Northwest and British America, and, as I have found the latter breeding on the Rio Grande, I would expect also to find the White Pelican.

PELECANUS FUSCUS, *L.—Brown Pelican.*

Abundant along the coast, and in the bayous and lagoons adjoining. In going down, I was too early for their eggs, and, in coming back, too late. At Padre and Mustang Islands, they were very abundant, and a set of two eggs, laid after I left, was sent me from there, where they breed on the small sand islands, in great numbers, along with Gulls and Terns. Two eggs sent me from Padre Island measure 3.20 by 2.00 and 2.90 by 1.93.

GRACULIDÆ.

GRACULUS MEXICANUS, *(Brandt) Bp.—Mexican Cormorant.*

Frequently seen on the extreme southern border, both about the salt ponds and marshes and the fresh-water lagoons up the river. I saw them in flocks of a dozen or more, but generally in pairs or groups of three or four. I have seen them swimming, standing on the shore, and perched on snags over the water. No nests were found, but they undoubtedly breed there, particularly near the coast. I did not notice any at Hidalgo. Other members of this family were seen in great numbers on the coast going down, but none obtained.

70—♀—26.00 x 40.25 x 10.25 x 6.50. Mar. 24, Brownsville.

LARIDÆ.

LARUS ARGENTATUS, *Brünn.—Herring Gull.*

Not noticed far below Galveston, where, March 1st, they were very abundant and moulting.

LARUS DELAWARENSIS, *Ord.—Ring-billed Gull.*

Very abundant at Galveston, March 1st, where it was in company with *L. argentatus* and *L. atricilla.* It was not noticed farther south than Indianola.

LARUS ATRICILLA, *L.—Laughing Gull.*

Everywhere abundant coastwise, especially so about Corpus Christi Bay. On May 16th, when at the marshes, we would meet this bird in small companies. By their actions, I knew their nests were near, and yet I did not come upon them. They are less wary and more numerous than any other Gull or Tern on the coast.

10—♀—17.00 x 44.00 x 14.00 x 5.00. Mar. 3, Galveston.
111—♂—16.25 x 42.00 x 12.75 x 4.25. Mar. 29, Brownsville.

STERNA ANGLICA, *Montagu.—Marsh Tern.*

This Tern was observed at almost all points along the coast as I went down. At Galveston, March 1st, it was in company with *Sterna caspia*, Caspian Tern, and *Sterna forsteri*, Forster's Tern, in about equal proportions. At Nueces Bay and Corpus Christi Pass, it was quite common. On May 16th, when collecting eggs of Stilt, *Himantopus nigricollis*, and Forster's Tern, *Sterna forsteri*, I found on the same island, but some distance from the latter, a colony of nests but very recently abandoned. Over the locality and screaming about our heads were a few of this species, and no others. The nests, some fifteen or twenty in number, were composed of little bunches of grass in saucer-shape, and contained bits of broken shells and fresh excrement, with abundance of the latter about the nests. Some three hundred or more feet distant were the Forster's Terns mourning over their losses. As we left the nests of the Marsh Tern, the parent birds followed us for a short distance, and then flew away from the island. The island was small, and situated far out in the shallow water. The bird shot for identification was a male. Fortunately, we found an unfertilized egg. In shape it closely resembles that of *S. forsteri*, but it is more roundly pointed. In color, the drab, instead of being yellowish, has a slight greenish tinge. The markings are also similar to those of Forster's Tern in form and color, but are more thickly placed near the larger end. It measures 1.78 by 1.34 of an inch.

2—♀—14.25 x 36.00 x 11.25 x 3.90. Winter plumage, Feb. 28, Galveston.
442—♂—15.25 x 37.50 x 11.90 x 4.60. Summer plumage, May 16, Brownsville.

STERNA CASPIA, *Pall.—Caspian Tern.*

I met this fine bird in limited numbers all the way from Galveston to Padre Island on the coast. I saw more about Galveston than at any other point. Bill red, dusky-tipped. Feet black. Iris hazel.

1 —♂—21.60 x 53.00 x 16.50. Feb. 28, Galveston.
1a—♂—20.75 x 51.00 x 16.00. Feb. 28, Galveston.
4 —♀—22.50 x 55.25 x 17.00 x 6.50. Feb. 28, Galveston.

STERNA CANTIACA, *Gm.—Sandwich Tern.*

This long-billed little fellow was seen in abundance about Corpus Christi Pass. No specimens were secured, but I have received a skin from there since my return. They breed in that vicinity.

STERNA FORSTERI, *Nutt.—Forster's Tern.*

I found this species quite numerous at Galveston, March 1st. On May 16th, I found it breeding in the salt-marshes on the Rio Grande. I became familiar with this Tern in the spring of 1876 in Western Minnesota, and to find it here again was like meeting an old friend. On the same low and nearly submerged island where we found the eggs of Stilt, *Himantopus nigricollis*, and some hundred yards or more distant, was a group of these Terns upon the ground near their eggs. When we approached them, they commenced screaming and flying about in great distress. They had only fairly begun to lay, as no set was complete. One or two eggs were all that any nest contained, and some were not occupied. The nests were situated farther away from the water than the Stilt's, but still where the mud was wet, and consisted simply of a patting-down of grasses and soil into a shallow saucer-shaped depression. About twenty eggs were secured between Dr. Merrill and myself. Several birds were shot; but as I had more valuable skins to prepare, I could not preserve them. Eggs with ground-color drab, with a more or less yellowish tinge, and pretty evenly covered with spots and dashes of different shades of brown; average size 1.86 by 1.37.

4—♀—14.75 x 30.00 x 9.75 x 5.00. Winter plumage, Feb. 28, Galveston.

STERNA SUPERCILIARIS ANTILLARUM, (*Less.*) *Coues.*—*Least Tern.*

I did not notice this smallest of the Terns until I reached the Rio Grande. Along the bed of the river between Brownsville and Hidalgo it was seen frequently. Only one specimen secured. Its mate fell in the river and was lost, as were several that had been shot before. It undoubtedly breeds on the border, but I did not meet with its nest. On my return to the coast I again saw it.

416—♂—9.75 x 19.75 x 9.60 x 3.60. May 11, Hidalgo.

RHYNCHOPS NIGRA, *L.*—*Black Skimmer.*

I saw a few of these curious birds at Corpus Christi and Point Isabel. The largest group I saw was of four. The rest were generally in pairs. They were flying near the shores of the bays, and did not appear shy.

PODICIPIDÆ.

PODICEPS DOMINICUS, (*L.*).—*San Domingo Grebe.*

From their extremely small size I am sure I saw several of these cunning birds, but I must own to my not being able to shoot them. I saw them in the lagoons and marshes, but they are by no means abundant.

ART. II.—DESCRIPITONS OF FISHES FROM THE CRETACEOUS AND TERTIARY DEPOSITS WEST OF THE MISSISSIPPI RIVER.

BY E. D. COPE.

TRIÆNASPIS VIRGULATUS, *Cope, gen. et sp. nov.*

Character genericus.—Shape anguilliform; vertebræ elongate, contracted medially, furnished with wide and short diapophyses over the abdominal region. Cranium elongate, not beaked; jaws furnished with acute teeth of moderate size (but small number in the typical specimen). Dorsal fin short, median in position, its radii cartilaginous. Ventral fins entirely behind dorsal. Caudal and anal fins unknown, the latter probably wanting. The dorsal and ventral surfaces each protected by tripodal shields. Shields of other forms on the sides.

This, with the genus following, introduces for the first time into the North American extinct fauna the family of the Dercetiform fishes. The relationship of the family has been discussed by various authors, especially by Pictet and Von der Marck. The former regards them as *Teleostei;* the latter as "Ganoids". As I do not adopt the division signified by the last name, I find Professor Pictet's view nearer to the point. The specimens indicate further that the *Dercetidæ* belong to the *Actinopteri*, and probably to the order *Hemibranchii*. The only alternative is the order *Isospondyli*, and the characters which separate the two are not clearly shown in the specimens. Distinct bones below the pectoral fins may be interclavicles, which belong to the *Hemibranchii*.

As compared with the other genera of this family, *Triænaspis* differs in the very short dorsal fin and posterior position of the ventrals, with the probable absence of the anal. The scuta differ in form from those of some genera.

Character specificus.—The head is relatively large and the body slender. The fins are all small. The rami of the mandible do not present a long symphysis. The opercula are subround, and the bases of the pectoral fins are quite posterior to them. The dorsal and ventral scuta are triradiate, the median branch of the three being directed anteriorly. A series of smaller triradiate scales extends along the superior lateral region just below the dorsal row, and there is a similar one above the abdominal row on each side. Between these and the vertebral axis there are numerous narrow, band-like scuta, directed backward and toward the vertebræ. Radii: D. 9 or 10; P. 12 or 13; ventrals disturbed. Vertebræ: to first ray of dorsal fin, 27–28; from dorsal first ray to opposite base of ventral fin, 10. The dorsal and ventral scuta correspond in number to the vertebræ.

Measurements.

	M.
Length of portion of fish preserved	0.121
Length of head	0.030
Width of head behind	0.008
Depth of body at end of pectoral fin	0.0035
Depth of body behind ventral fin	0.0070
Depth of dorsal fin	0.0070
Length of dorsal fin	0.0040

This fish was discovered by *Dr. F. V. Hayden*, Geologist-in-Charge of the United States Geological Survey of the Territories in the Niobrara Cretaceous horizon of Dakota.

LEPTOTRACHELUS LONGIPINNIS, *sp. nov.*

This species agrees with the type-species of *Leptotrachelus* of Von der Marck in the position of the ventral fins beneath the dorsal, in the great elongation of the anterior vertebræ, and in the lanceolate form of the head. It differs from that species (*L. armatus* v. d. Marck) in its more elongate dorsal fin, in which it approximates the genus *Dercetis*.

Two incomplete specimens represent this species, neither of which possesses the caudal nor exhibits an anal fin. In one of them, the cranium is preserved in a somewhat dislocated condition at the extremity of its very long peduncle. The vertebræ of this region, which might be called a neck, are several times as long as those of the dorsal series. The femoral bones are slender, and commence below the anterior part of the dorsal fin. In one specimen, the ventral fin originates below the twelfth dorsal ray; in the other, below the fifth. As the latter is the least distorted, I suspect the fin to occupy its normal position. The dorsal radii are slender, and the middle and anterior longer than the posterior; they number twenty-seven in one specimen, and nineteen in the other, where the posterior portion is broken away. The ventral rays are hair-like, and do not extend to the line of the distal end of the dorsal. The pectoral fins are well developed, and occupy their usual position. The cranium is much dislocated, but the snout is acute and attenuated. The dermal scuta consist of median, dorsal, and ventral rows of tripodal form. There are some slender, longitudinal, hair-like bodies on the sides, which cross the ribs. The vertebræ present the characteristic elongate centra. The diapophyses are longer on the postventral than on the preventral region. Each scutum is as long as a vertebra.

Measurements.

	M.
Length of neck of No. 1	0.045
Length of neck to base of dorsal fin	0.071
Length of base of dorsal fin	0.025
Elevation of dorsal fin	0.009

Depth of body just behind dorsal fin	0.006
Depth of body in front of dorsal (No. 2)	0.010
Five vertebræ measure (No. 2)	0.017
Length of ventral fin (No. 2)	0.016

Discovered by *Dr. F. V. Hayden* in the Niobrara Cretaceous of Dakota.

This fish is particularly welcome, as displaying generic identity with a species of the Westphalian Chalk, and with a third, from the Slates of Mount Lebanon. It thus indicates a closer relation between these faunæ than could be predicated on the discovery of the family to which it belongs. The horizon of Mount Lebanon has been regarded as Eocene, but Heckel and Von der Marck place it in the Upper Cretaceous. To the conclusion of these palæontologists, the discovery of this and other species described in this paper lends support.

ICHTHYOTRINGA TENUIROSTRIS, *gen. et sp. nov.*

Character genericus.—Head attenuated and produced into a beak; jaws with weak teeth, of equal lengths. Dorsal fin small, composed of soft rays. Body covered with small, round scales. Vertebræ subelongate.

The specimens representing this genus are so far imperfect that the caudal and anal fins remain unknown. But they show clearly that it differs from the genera which appear to be related, namely, *Dercetis* and *Rhinellus*, in the absence of dermal scuta and in the short dorsal fin. But one species has come under my observation.

Character specificus.—The dorsal fin is about half as far behind the cranium as the length of the latter. It is supported by well developed interneural spines; but these elements do not exist in front of it. Muzzle very slender, the mouth apparently opening to behind the orbit. The scales closely imbricate, in about twenty longitudinal series, above the vertebral line of the side. Dorsal radii, II. (rudimental), 12. The superior supplementary ribs are numerous.

Measurements.

	M.
Length to opercular border	0.043
Length to base of first dorsal ray	0.061
Length of base of dorsal fin	0.006
Elevation of dorsal fin	0.010
Depth to vertebral column between dorsal fin and head	0.005
Five vertebræ	0.006

From Cretaceous No. 3 of Dakota (*Dr. F. V. Hayden*).

SPANIODON SIMUS, *sp. nov.*

Another genus of the Lebanon is represented in the collections from Dakota by a rather abundant species. The elongate anterior teeth of the dentary bone and the edentulous maxillary are exhibited by the new species; but I am unable to find the long premaxillary teeth said to exist in the typical species of *Spaniodon*. As the absence of these may be due to accident, and as all other characters coincide, I leave it under this genus. From the known genera of *Saurodontidæ* of the same horizon, the edentulous maxillary bone, combined with long dentaries with round section, and the absence of pectoral and ventral spines, separate it. To the characters named, I may add that there are no dermal scuta, but cycloid dorsal scales. Whether the body was scaly below the lateral line is not clear from our specimens.

There are numerous slender branchiostegal rays. The pectoral fins are inferior; the dorsal is not large, is composed of soft rays, and is submedian in position. The ventral fins originate behind it, and the anal fin still more posteriorly, leaving a long abdominal cavity. The ribs are long, and the superior ribs numerous. The femora are elongate, and are narrowed and converging anteriorly. They do not appear to be fissured. The dorsal centra are not elongate, and are grooved.

Character specificus.—Three specimens, more or less mutilated, represent this fish; one of these is almost entire, and serves as the type of my description.

The gape of the mouth is wide, and is directed forward and upward. The extremity of the muzzle is the premaxillary bone, and this is concave backward, so as to give, with the oblique mouth, a bulldog expression. The superior profile is gently concave. The opercular apparatus is produced slightly downward and backward, so that the posterior depth of the head equals its length. The partly opened mouth displays two long, straight, acute teeth on the anterior extremity of the dentary bone. The pectoral fins are large, while the ventrals are small. The anal is moderate, and has a concave border. Radii: D. II. 20; A. II. 14; V. 8; P. 14. Vertebræ: D. 32; C. 13. Anterior dorsals not different from the others.

Measurements.

	M.
Total length	0.160
Length to opercular border (axial)	0.047
Length to dorsal fin (axial)	0.072
Length to ventral fin (axial)	0.100
Length to anal fin (axial)	0.117
Length to caudal fin (axial)	0.135
Depth of head posteriorly	0.033
Depth of body at dorsal fin	0.035
Depth of body at first anal ray	0.020
Depth of caudal peduncle	0.012

This genus is one of the *Isospondyli*.

SARDINIUS NASUTULUS, *sp. nov.*

This species is referred to a genus established by von der Marck for three species of Isospondylous, and probably Clupeoid fishes, which have been found in the Upper Cretaceous of Westphalia. They present mostly negative characters, resembling *Clupeæ*, without abdominal nor cephalic serration, and with minute teeth. The fishes here referred to this genus do not exhibit any teeth; but as my specimens, five in number, are small, it is not certain that adults may not display them. The presence or absence of teeth is not a constant character in all *Clupeæ*, according to Günther. *Leptosomus* v. d. Marck does not appear to me to differ from *Sardinius*.

The *Sardinius nasutulus* is a small species of moderately elongate form, with a rather long head and protuberant muzzle. The dorsal fin originates in front of the middle of the body, and the ventral fins take their rise immediately below its anterior rays. The anal originates behind the line of the dorsal, but far enough forward to leave an elongate caudal peduncle, which is also quite stout. The pectoral fins reach nearly to the base of the ventrals. Radii: D. 9; A. 11, about; V. about 8. The boundaries of the scales are difficult to define on the specimens, but there do not appear to be more than eight or ten longitudinal series. Their sculpture consists exclusively of concentric grooves. There are fourteen dorsal and fifteen caudal vertebræ, all with long and slender neural spines. Of the former, five are anterior to the first interneural bone, which is directed downward; the last caudal vertebra is slender and turned upward. The scales are very much attenuated, so that their number cannot be made out. The ribs are stout for the size of the fish. The superior surface of the head is rather narrow, and tapers with straight borders to the muzzle.

Measurements.

	M.
Length of head (including operculum)	0.0115
Length to base of dorsal fin (axial)	0.0175
Length to base of ventral fin (axial)	0.0170
Length to base of anal fin (axial)	0.0280
Length to base of caudal fin (axial)	0.0410
Length of base of dorsal fin	0.0055
Length of base of anal fin	0.005?
Width of skull between orbits	0.0010
Depth of body at first dorsal ray	0.0065
Depth of body at middle of caudal peduncle	0.0050

Niobrara Cretaceous No. 3 of Dakota (*Dr. Hayden*).

SARDINIUS LINEATUS, *sp. nov.*

Two specimens of similar small size constitute the basis of information respecting this species. Many characters can be derived from these; but the dorsal fin being absent from one of them, and the ventrals and posterior part of the body from the other, the mutual relation of these fins is not ascertained. The form is very elongate, and the head is lanceolate. The dorsal fin is distant from both cranium and caudal fin. The fins are composed of slender rays, and the anal is not elongate; the caudal is deeply forked, and no vertebræ are included behind the basis of its external rays, although four are embraced within the convergent lines of the anterior upper and lower fulcra. The vertebræ are short, and the neural and hæmal spines are well developed, while the ribs are weak. Vertebræ: Dorsals to first descending interneural spine, 19; of the caudal series, 12.

There is no indication of an adipose fin. The posterior portion of the dorsal fin is lost, so that the number of rays cannot be ascertained; nine interneurals remain. The pectoral fin is long and slender, but does not reach to the ventral. Anal rays not elongate, nine in number. The bones of the head are so thin that their boundaries are not easily determined. The opercular apparatus is well developed, and there are two approximated parallel ridges on what appears to be the top of the head. The scales are so thin that their number is not ascertainable. A peculiarity of the species, from which it derives its name, is that its sides are marked by longitudinal bands of a darker color than the intervening spaces. There are six above the vertebral column and six below it. I cannot determine that this appearance is due to rows of scales; but they rather seem to be true color-stripes.

Measurements.

	M.
Length of head of No. 1	0.012
Length to base of dorsal fin	0.032
Depth half-way between head and dorsal fin	0.006
Length of caudal region of No. 2	0.019
Length of caudal fin	0.009
Depth at first anal ray	0.005
Depth at base of caudal fin	0.0045

Niobrara Cretaceous of Dakota; found by *Dr. Hayden.*

SARDINIUS PERCRASSUS, *sp. nov.*

The block which contains specimens of ***Triænaspis virgulatus***, ***Leptotrachelus longipinnis***, ***Sardinius lineatus***, and another species undetermined, contains also the very distinct fish now described under the name at the head of this paragraph. It is distinguished from the other ***Sardinii*** by its very robust form, and from the ***S. nasutulus*** by the origin of the ventral fin being behind the perpendicular of the first dorsal ray.

The anterior part of the head is damaged; the operculum is distinct. There is an elongate postclavicle, and the position of the small pectoral fin is normal. The origin of the dorsal fin is much nearer the head than to the caudal fin; its rays, like those of all the other fins, are slender. The ventrals originate under the fifth dorsal ray, and are supported by slender femora, which appear to be undivided, and converge to an acute junction anteriorly. The anal fin is short and entirely behind the dorsal. The neural spines and interneurals and interhæmals are weak, while the ribs are strong. The caudal peduncle is exceedingly stout, nearly equalling the body. Radii: D. 10; A. 9; V. 6. Vertebræ: D. 14, four anterior to first interneural; C. 13. The scales are too attenuated to be counted. It is quite possible that this species possesses an adipose dorsal fin, in which case its present generic reference must be abandoned. Better specimens only can solve this question.

Measurements.

	M.
Total length (head imperfect)	0.040
Length to opercular border	0.010
Length to first dorsal ray (axial)	0.013
Length to first ventral	0.016
Length to first anal	0.023
Length to base of caudal fin	0.032
Length of base of dorsal fin	0.005
Length of base of anal fin	0.002
Depth at first dorsal ray	0.011
Depth at first anal ray	0.009
Depth at base of caudal fin	0.0065

From the Niobrara Cretaceous of Dakota; from *Dr. F. V. Hayden.*

TRICHOPHANES FOLIARUM, *sp. nov.*

The Tertiary shales of Florissant in the South Park of Colorado have already yielded numerous species of plants, insects, and fishes, which have been described by Messrs. Lesquereux, Scudder, and myself.* Six species of fishes have been determined, three of which pertain to a genus of *Catostomidæ*, which I had originally procured from the paper coal of Osino, Nevada. On this ground, an approximation of the horizons of the two localities was made. I now record the occurrence of a species of the second genus found in the Osino coal, *Trichophanes*, of which the *T. hians* has been up to the present time the only one known. The epochal identification of the two formations is thus confirmed.

The *Trichophanes foliarum* is represented by a larger individual than the *T. hians*, but which wants the posterior part of the body, including the caudal and part of the anal fin. The generic and family characters are, however, very clearly visible in the anterior portion of the skeleton.

The premaxillary bone forms all or nearly all of the superior arcade of the mouth. There are a few rows of small equal teeth *en brosse* on the dentary bone. Four rather wide branchiostegal rays are visible in the specimen. The posterior superior angle of the operculum (which is displaced in the specimen) is drawn out into an acute short spine. There is a row of small teeth *en brosse* probably on the palatine or pterygoid bone. The anterior vertebræ are unmodified, and the centra are not elongate. A strong acute spine supports the dorsal fin, and a similar one the anal fin in front. There is an elongate postclavicle on each side, which extends parallel with the femur to the base of the ventral fin. The femur is divided; the external portion is straight, and extends to the clavicle, while the other portion is curved inward and forward, reaching the apex of the corresponding bone of the opposite side. Ventral radii, 8. The dorsal fin originates above the ventral fin. The scales are peculiar, and characteristic of the genus. They are very thin, and without or with minute sculpture. Their borders are fringed with long, closely-set, bristle-like processes, which correspond to the teeth of the ctenoid scale.

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* Bulletin U. S. Geol. Surv Terra. 1875, n. 1, 3.

This genus, *Amphiplaga*, and *Erismatopterus* form a group which probably belongs to the family of *Aphrodediridæ*, which is represented in American waters by the recent genera *Aphrodedirus* and *Sternotremia*. The present species, the only one in which the parts are large enough and sufficiently well preserved for observation, exhibits the furcate character of the femora, which characterizes the family in question among Physoclystous fishes.

Character specificus.—The scales extend on the cheeks and abdomen; there are nine or ten longitudinal rows above the vertebral column and about sixteen below it. The head is moderately elongate and deep behind. The mouth is subterminal, and the extremity of the premaxillary bone extended backward would reach about half-way to the orbit. Ribs stout; neural spines slender. The interneurals visible number 11, but the posterior part of the dorsal fin is wanting. These bones have thin anterior and posterior laminar expansions. The anterior interneural strikes the fifth vertebra from the head; between this one and the first interhæmal there are nine vertebræ.

Measurements.

	M.
Length of head to first vertebra	0.028
Depth of head posteriorly	0.022
Length of mandibular ramus	0.013
Length to scapula	0.035
Length to dorsal fin	0.050
Depth at middle of dorsal fin	0.023

From the Tertiary shale of Florissant, Colorado; discovered by my friend *Dr. S. H. Scudder*, of Boston, collaborator of the United States Geological Survey of the Territories.

PRISCACARA OXYPRION, *sp. nov.*

Five specimens in nearly complete preservation represent this species in our collections. It is more nearly allied to the *P. serrata* than to the other species, as the spine of the ventral fin is large and robust. It differs from that and from all the other known species of the genus in the small number of the radii of its anal fin. It agrees with *P. serrata* in the small number of the rays of the second dorsal. It is a smaller species than the *P. serrata*, being intermediate in size between it and the *P. pealei*. It is especially marked by the long, acute serræ of the entire posterior and inferior margins of the preoperculum. The operculum, suboperculum, and cheek are scaled; the preoperculum is naked.

Formula: Br. VIII; D. X—11; V. I—5; A. III—8; Vert. D. 10; Caud. 14. The form is an elongate oval, rather more elongate than any other species of the genus. The mouth is terminal and the front gently convex and descending. The length of the head enters the total, less the caudal fin, two and a half times, and the greatest depth is half of the same. The dorsal spines are long and strong, the longest equalling the soft rays in length. The anal spines are very robust, the second or longest not equalling the longest soft rays of the same fin. The origin of the first spine is below the first ray of the soft dorsal. There are three long and one short interneural bones in front of the dorsal fin. The origin of the ventral is below the third (or fourth) dorsal spine. The vertebræ have two fossæ on each side, separated by a ridge. The jaws are edentulous. The scales are small and the specimens very well preserved.

In the largest specimen, I count, in a vertical line drawn from the first dorsal soft ray to the middle of the abdominal line, fifteen longitudinal rows of scales above and twenty-five below the vertebral column. On the opercular flap of a smaller, the typical specimen, I count nine vertical and fourteen transverse rows of scales.

Measurements.

	M.
Length of type-specimen	0.137
Length to base of caudal fin	0.109
Length to apex of first interhæmal	0.067
Length of head	0.040
Length of third dorsal spine	0.024
Length of second anal spine	0.018
Length of pectoral spine	0.019
Depth at first dorsal spine	0.050
Depth at first anal spine	0.041
Depth of caudal peduncle	0.019

The lateral line is visible in the largest specimen. It extends parallel to the dorsal border, marking at its greatest convexity less than one-third the distance from the vertebral column to the dorsal outline. It disappears behind the vertebral column below the seventh soft dorsal ray, and does not reappear.

This fish came from a deposit of the Green River Shales on Bear River, Wyoming.

PRISCACARA PEALEI, *sp. nov.*

Outline elliptic, with the extremities contracting equally or symmetrically to the head and tail. Depth at ventral fins entering length (with caudal fin) 2.60 times. Mouth rather small; length of head entering total length 3.8 times. Short conic teeth *en brosse.* Preorbital and preopercular bones finely serrated on their free margins. Vertebræ: D. 7; C. 14. Radii: D. X—14; A. III—11; V. I. 5 or 6. The dorsal spines are rather slender; the anal spines are stouter, but shorter; the ventral spine is weak and slender. The ventral fin when appressed against the belly fails to reach the anal fin by a space a little greater than the length of the ventral spine; its origin is beneath the third dorsal spine. The scales are difficult to observe on the specimens, but there are not less than 15 to 17 longitudinal rows along the abdomen in front of the anal fin.

Measurements.

	M.
Total length	0.130
Axial length of head	0.035
Axial length to first dorsal spine	0.038
Axial length to first dorsal soft ray	0.062
Axial length to first anal spine	0.070
Axial length to base of caudal fin	0.103
Depth at orbit	0.025
Depth at first anal spine	0.041
Depth of caudal peduncle	0.016
Length of fifth dorsal spine	0.018

This species is similar in size and proportions to the *Priscacara liops*, but differs in having constantly but seven dorsal or abdominal vertebræ, while that species presents nine. I have not observed any serratures on the preoperculum of the *P. liops*, but the typical specimens are imperfect in that region, although good impressions of it remain on the matrix.

Two complete specimens present all the characters of this species, while in two others all the more important ones can be seen. Two additional specimens may be referred to it with the greatest probability. Some of these were obtained by *Dr. A. C. Peale*, in charge of one of the parties under Dr. F. V. Hayden, from the shales of the Green River formation of Wyoming. The species is dedicated to Dr. Peale, in recognition of his services to geological science.

PRISCACARA CLIVOSA, *sp. nov.*

The species of *Priscacara* are referrible to two sections. In the first, the ventral spine is very strong, and there are but ten or eleven soft dorsal radii: here belong *P. serrata*, *P. cypha*, and *P. oxyprion*. In the second, the first ventral spine is weak and slender, and there are thirteen or fourteen radii of the second dorsal fin: in this division belong *P. liops*, *P. pealei*, and *P. clivosa*.

In the last-named fish, there are eight dorsal and fourteen caudal vertebræ. Radii: D. X—13; A. III—11. The ventral fin appressed, nearly reaches the base of the anal, a point in which it differs materially from the two allied species. Another characteristic is the form of the profile, which resembles that of some of the species of *Geophagus*. This descends steeply from a point just anterior to the base of the dorsal fin, giving an obliquity to that part of the outline and an inferior position to the mouth. The vertebral column is more arched anteriorly, appropriately to the prominence of the anterior dorsal region. The depth at the base of the first dorsal fin enters the total length (with caudal fin) 2.6 times, and the length of the head 3.6 times in the same.

Measurements.

	M.
Total length	0.115
Axial length of head	0.032
Axial length to line of first dorsal	0.032

Axial length to origin of ventral fin	0.041
Axial length to origin of anal fin	0.057
Axial length to origin of second dorsal fin	0.056
Axial length to origin of caudal fin	0.082
Depth of caudal peduncle	0.016

The preopercular border is not visible in the only specimen of this species known to me. The operculum is scaly. There are 11-13 rows of scales on a line from the vertebral column to the abdominal border.

I note here that further examination shows that there are from 20 to 25 longitudinal rows of scales on the side of the abdomen of *P. serrata*, but the number is not exactly determinable, owing to the condition of the specimens.

DAPEDOGLOSSUS ÆQUIPINNIS, *sp. nov.*

Two specimens present the principal character of this species, viz, the equality in number of rays in the dorsal and anal fins and the near equality in their size. The radii are in one, D. 23; A. 22: in the other, D. 22; A. 22. In *D. testis*, the formula is D. II—18; A. II—26. The vertebræ in one of the specimens of *D. æquipinnis* number, D. 19; C. 27: while in *D. testis* there are, D. 18; C. 24-25. (The number, 21 dorsal, originally given, must be corrected, as based on an imperfect specimen.) In *D. æquipinnis*, the first pectoral ray is not so largely developed as in *D. testis*, not being of unusual size. The hyoid apparatus and vomer are closely studded with teeth, as required by the generic character.

Measurements.

	M.
Length of No. 1	0.051
Axial length of head of No. 1	0.014
Axial length to line of anal fin	0.030
Axial length to line of dorsal	0.028
Axial length to origin of caudal	0.040
Depth of head	0.012
Depth at first dorsal ray	0.008
Depth of caudal peduncle	0.004
Length of No. 2	0.092
Depth at middle of dorsal line	0.032
Depth at base of dorsal fin	0.024
Depth of caudal peduncle	0.008

The specimens described are much smaller than those of the *D. testis* yet known, but No. 1 is probably young. This fact will not account for the peculiarity of the radial formula, etc.

I add here that there are two vertebræ included within the caudal fin in *Dapedoglossus*.

ART. III.—DESCRIPTIONS OF NEW TINEINA FROM TEXAS, AND OTHERS FROM MORE NORTHERN LOCALITIES.

BY V. T. CHAMBERS.

ANAPHORA.

A. **TEXANELLA**, *n. sp.*

Very distinct from *plumifrontella*, *popeanella*, and *arcanella* Clem., and from *agrotipenella* and *mortipenella* Grote, nor can I recognize it at all in either *Scardina* or *Bombycina* as described by Zeller.

Palpi overarching the thorax; dark brown on the outward, luteous-brown on the inner surfaces. Antennæ compressed, straw-yellow; thorax dark gray-brown; fore wings brown, tinged with grayish-yellow; the usual spot at the end of the disk indistinct; the other spots common to the wings of the other species I cannot find in this. One of them may be represented by an indistinct blackish line beneath the middle of the fold. Hind wings and abdomen fuscous-gray, like the thorax, and a little darker or rather less yellowish than the fore wings. Under surface of both wings grayish-fuscous. Smaller than any specimens that I have seen of the other species, having an *alar expansion* of only nine lines. Bosque County, Texas.

TINEA.

T.? **7-STRIGELLA**, *n. sp.*

Vertex white: basal joint of antennæ white on the upper, brown on the lower surface; stalk of antennæ black, with a white line along each side. Thorax and basal half of fore wings blackish-brown, the apical half having its costal half blackish-brown and its dorsal half white, the costal brown of the apical half being separated from the basal brown half by a white costal streak, which extends into the dorso-apical white part; beyond this costal white streak are five others, which likewise extend across the costo-apical brown to the dorso-apical white part of the wing, thus dividing it into a number of large spots; the first of these five streaks is oblique, the others perpendicular to the costal margin, and the space or brown spot between the second and third is larger than that between the others. Dorsal cilia brown, with numerous narrow white streaks running up through them from the dorsal white margin. In the basal half of the wing, there is a narrow white line extending along the fold, and an oblique white costal streak which almost reaches the fold. Face and palpi grayish-fuscous. Under surface of body and the legs yellowish. *Alar expansion* a little over one-fourth of an inch. Bosque County, Texas.

The palpi in my single specimen are a little injured, and I have not examined the neuration. Possibly it may not be a true *Tinea*.

T. UNOMACULELLA, *Cham.*

Besides the yellow spot at the end of the disk mentioned in the description of this species, there is also a smaller one on the fold near its end, and one on the extreme apex of the thorax. There are also about seven small ones around the base of the cilia, and frequently the wing is more or less dusted with yellow scales.

ANESYCHIA.

A. HAGENELLA, *n. sp.*

Costal part of the fore wings nearly to the tip, and spreading nearly half across the wing in width, blackish-brown; the remainder of the wing white except as follows: the dark brown sends five projections or teeth into the white; the first is near the base, the second a little farther back, third about the middle, the fourth a little behind the third, and the fifth projects toward the apex; there is a small blackish spot on the base, then a very small one, then one a little larger, all beneath the fold; then another on the fold, another beneath it again, and then two others above it; there is also a minute spot on the basal angle, and nine others (six costal and three dorsal) around the base of the cilia. There are also eight spots on the thorax, one of them just before the base of the wings, one just behind each eye, two on the disk, and one on each side of the apex. Head white; antennæ fuscous; second palpal joint blackish, tipped with white, third white; hind wings silvery-white; abdomen fuscous: legs pale stramineous, with a silvery lustre, stained with brown on their anterior surfaces. *Alar expansion* 9½ lines. It resembles *A. trifurcella* Cham. more nearly than any of our other species. Bosque County, Texas.

HYPONOMEUTA.

H. ZELLERIELLA, *n. sp.*

This species approaches nearer to *H. longimaculella* Cham. than to any of our other species. The third palpal joint is white, dusted with blackish scales; second joint blackish, tipped with white. Head white. Basal joint of antennæ white, tipped at the apex above with brown; stalk fuscous; thorax white, with a black spot behind each eye, and one touching the base of each wing, one above each tegula, and one on each side of the apex. Fore wings white, with the costal third stained with pale ochreous, and separated from the white part by three long black dashes, the first of which is before the middle, the second extends back from about the middle, and the third is just before the apex. In the pale ochreous costal part of the wing is a short fuscous basal streak just within the costa, and behind it is a small fuscous costal spot. Just within the costa, about midway of the wing-length, is another small spot, and another just before the cilia, slightly within the margin. The direction of all these spots is longitudinal, and under the lens all this pale ochreous or discolored costal part of the wing is minutely sprinkled with blackish scales. In the white dorsal part of the wing is a black basal spot on the fold, another a little farther back on the fold, then two beneath the fold, another on the fold about midway of the length of the wing, behind that is another on the fold, then another beneath it, and then another, and yet another above the fold; there is also an indistinct dash just beyond the anal angle, and then the usual nine spots around the base of the cilia, three of them costal. Hind wings silvery-white, with a faint fuscous tinge. Abdomen fuscous above; tuft, under surface and legs straw-yellow. *Alar expansion* 10½ lines. Bosque County, Texas.

DEPRESSARIA.

In volume 4 of the Canadian Entomologist I described several species which I then placed in this genus. I was induced to place them here by the fact that I did not then know the indefinite extent of the genus *Gelechia*, and believed, as I still do, that the affinities of these species were rather with *Depressaria* than with the true *Gelechia*, and I was not acquainted with *Cryptolechia*. Subsequently some of those species were referred to *Cryptolechia*, but most of them to *Gelechia*, one forming the type of a new genus, *Cirrha*. There is, however, no sufficient reason perhaps for separating this species (*C. platanella*) from *Gelechia* as at present unrestricted, for *Gelechia* at present is a miscellaneous assemblage of species, many of which possess but little affinity for each other. Thus, all the species which in volume 4 I referred to *Depressaria* are referred to *Gelechia* or *Cryptolechia* except two?—*D. versicolorella* and *D. pallidochrella*, and neither of these is a true *Depressaria*, though perhaps as properly located in it as in *Gelechia*, especially *D. versicolorella*. Thus, among over three hundred species of *Tineina* that I have found in Kentucky, the one described below as *D. eupatoriiella* is the only *Depressaria*, and it is an aberrant species. The species described below as *D. fernaldella* was received from Professor Fernald from Orono, Maine; and, as illustrating the multitude and variety of the species of *Tineina* in this country, I will here state that, according to my estimate, not less than eight hundred species of *Tineina* have been described from Canada and the United States south and west of Massachusetts (including that State), and not more than ten (probably not more than nine) belong properly in this genus. These are *atrodorsella* Clem., *cinereocostella* Clem., *grotella* Robinson, *heraclina* Deg., *hilarella* Zell., *lecontella* Clem., *nebulosa* Zell., *pulvipenella* Clem., *scabella* Zell., and *robintella* Pack.

The collection received from Professor Fernald contained twenty-eight species, six of which belong to *Depressaria*, viz:—*hilarella?* (I cannot determine it with certainty from the single worn specimen), *lecontella*, *atrodorsella*, *pulvipenella*, *fernaldella*, n. sp., and another smaller (new?) species, of which there is a single worn specimen; while, as above stated, I have found but a single *Depressaria* among over three hundred species found in Kentucky. Of the twenty-eight species in the Fernald collection, fourteen are believed to be new; and, in addition to the *Depressariæ* above mentioned, I recognize in it the following species:—*Tinea biflavimaculella* Clem., *T. grisseella* Cham., *T. carnariiella* Clem., *Amadrya effrenatella* Clem., *Adela biviella* Zell., *Gelechia dubitella?* Cham., *Ypsolophus straminiella* Cham., *Gracilaria purpuriella* Cham., and *Hyponomeuta evonymella* auct. Eight of the fourteen new species belong to *Gelechia* and two to *Cryptolechia*.

D. EUPATORIIELLA, *n. sp.*

Second joint of the palpi incrassate beneath toward the apex, the scales rather long and loose, scarcely forming a brush, and in the dead specimens not divided. Palpi, head, thorax, and fore wings dark or fuscous-gray; the palpi and wings dusted with blackish atoms, *each of which is a minute tuft*, and which along the costa take the form of small, obscure, and indistinct streaks; on the disk, before the middle, one of the blackish atoms is very obscurely margined behind by one or two whitish scales, and about the end of the disk is a minute whitish speck; apex of the wings rounded; hind wings not emarginate beneath the apex, pale grayish, with a faint purplish lustre—perhaps pale grayish-yellow would be as correct as pale gray; abdomen above of the same color, with the hind wings depressed, scarcely tufted at the sides; beneath it is gray, with a blackish spot on each side of each segment; legs dark gray or fuscous; under surface of the fore wings grayish-fuscous; that of the hind wings gray on the disk, the margins pale ochreous-yellow, dotted with blackish atoms. Antennæ fuscous, scarcely pectinate. The upper surface of the thorax is not dusted, and has a small double or bifid tuft at the apex. *Alar expansion* eleven lines. The larva feeds upon the under surface of the leaves of *Eupatorium ageratoides*, much in the same manner with that of *Nothris eupatoriiella* Cham. I did not observe it, as the leaves, when gathered, were supposed to be folded by the *Nothris* larva. The imago emerges in the latter part of July. 2 ♂, 1 ♀. Kentucky.

Both *atrodorsella* Clem. and *lecontella* Clem. have the minute bifid tuft on the thorax, as in this species, and the antennæ scarcely pectinate. The second joint of the palpi is, however, more brush-like in those species.

D. FERNALDELLA, *n. sp.*

Palpi slender, scarcely brush-like; antennæ scarcely pectinate; abdomen flattened above, scarcely tufted at the sides; apex of fore wings more acute, and the costa more arched than in *eupatoriiella*, *lecontella*, *atrodorsella*, or *pulvipenella*, and the wings also wider; indeed, in these respects it exceeds perhaps any of the species figured in Nat. Hist. Tin., vols. 1 and 12. The palpi are also unusually slender. Nevertheless, I think it is more properly referable to this than to any other genus. Palpi whitish, with the basal half of the outer surface of second joint brown. Head whitish. Both head and palpi have, however, a faint pinkish-yellow tinge, and the antennæ are still more distinctly tinged with it. Thorax and fore wings very pale ochreous, with a strong roseate or pinkish tinge. On the disk before the middle is a small blackish dot, which under the lens is resolved into two; further back, behind the middle, is another, and opposite the space between the two is another on the fold; these two latter are by a lens resolved into small spots of brownish dusting; farther back is a brownish line parallel (nearly) with the dorso-apical margin, but which the lens resolves into about nine small spots of dustings, scarcely confluent with each other, and one on each marginal veinlet (costal as well as dorsal); around the apex and margins near it are ten small brownish spots, scarcely visible or very indistinct without a lens. Hind wings yellowish, irrorate with fuscous, not emarginate beneath the apex; abdomen of nearly the same color with the hind wings; legs brownish on their anterior surfaces, the hind tarsi pale yellowish. *Alar expansion* 10 lines. Maine.

YPSOLOPHUS.

Y. QUERCIELLA, *Cham.*

The single bred specimen from which this was described was accidentally destroyed some years ago. From my notes and recollection of the species, I think it not improbable that it belongs in *Depressaria*, with palpi resembling those of *D. dictamnella* Zell.

DEPRESSARIA.

D. FERNALDELLA. (*Supra.*)

Since the preceding portion of this paper was prepared, I have received a letter from Professor Fernald, in which he states that he has "seen *Machimia tentorifuella* Clem., which seems to be identical with your [my] *Depressaria fernaldella*". I have not seen *tentorifuella*, and the species *may* be the same. There is certainly a close resemblance in many points; but an examination of *fernaldella* and a comparison of it with *tentorifuella*, as described by Clemens, shows many discrepancies. Thus *tentorifuella* has the vertex "*shaggy*", which is incorrect as applied to *fernaldella*. The latter has a row of ten small blackish spots around the apex, which are not mentioned by Dr. Clemens; and, furthermore, it has a brownish line before these spots, and nearly parallel to them, which is so unusual a mark that I think it must have struck Dr. Clemens had it existed in his species; yet he does not mention it. There are other less striking differences in ornamentation. *D. fernaldella*, while not a typical *Depressaria* by any means, seems to me to be more appropriately located in that genus than in *Cryptolechia*, to which I should refer *tentorifuella* as described by Clemens, and to which it has been referred by Zeller. While, therefore, the species *may* be the same, I, for the present at least, consider them to be distinct.

CRYPTOLECHIA.

In the Can. Ent. iv. 129, I have attempted to define a new genus under the name of *Hagno*, and in that connection have alluded to its resemblance to *Psilocorsis* Clem., which was known to me only by Dr. Clemens's writings, not having seen any of his species. The wings of *Psilocorsis*, as described by Dr. Clemens, seemed to me to differ materially from those of *Hagno*. I also suggested the probability that both might prove to be equivalent to *Cryptolechia*, which was then known to me only by scattered notices in various books. I find that *Hagno* is equivalent to *Psilocorsis*, and both are equivalent to a section of *Cryptolechia*.

C. CRYPTOLECHIÆELLA.

Depressaria? *cryptolechiæella*, Cham. Can. Ent. iv. 91.
Hagno cryptolechiæella, Cham. *ibid.* 132.

Smaller and prettier than any of the allied species known to me. The wings have a faint pinkish or roseate lustre, and have the lustre also of "watered silk". The transverse blackish lines are not visible to the naked eye, and the base of the wings is orange-yellow. If my recollection is not at fault, the larva feeds on leaves of the Holly (*Ilex*).

C. FAGINELLA.

Hagno faginella, Cham. Can. Ent. iv. 131.

The close resemblance of some allied species makes a more detailed description of this species than that heretofore given necessary.

The palpi are ochreous, with a blackish line along the under surface of the second joint, continued on to the apex of the third, and another on the outer and one on the inner surface of the third joint. *Cryptolechia* (*Psilocorsis*) *quercicella* Clem., according to Dr. Clemens, has the third joint black, with two yellowish-white stripes in front. I, however, have not seen the species, and I know from experience how easy it is to make a mistake as to the number and position of these lines. A species from Texas which I formerly (Can. Ent. vi. 231) identified with *faginella*, but which I now consider distinct (*vid. post*), and an undescribed species, of which a single specimen is before me, have the palpi exactly as I have described them in *faginella*—that is, the upper surface of the third joint is ochreous instead of black, as Dr. Clemens's account would make it. *C. faginella* has the head ochreous-yellow, and the thorax of the same color, only darker, as if tinged with fuscous. In this, the Texan species agrees with it. The undescribed species above mentioned, which is from Missouri, and has been bred by Professor Riley and Miss Murtfeldt from a larva feeding on *Ambrosia* has the head darker than in *faginella*, and of the same color with the thorax. *C. quercicella*, according to Dr. Clemens, has the head and thorax yellowish-brown (as in the Missouri specimen). *P. reflexa*, as described by Dr. Clemens, has the palpi as in *faginella* as to ornamentation; but from the fact that Dr. Clemens separates it from *quercicella* as a distinct section, characterized by the great length of the palpi, it is not necessary to refer to it further in this connection. *C. faginella* has the basal joint of the antennæ yellowish-ochreous, except a wide blackish line extending along its upper surface; *quercicella* has "two black stripes in front"; and the species from Texas and that from Missouri agree in this respect with *quercicella*. *C. faginella* and also the Texas and Missouri specimens have the stalk of the antennæ ochreous-yellow, with two blackish lines extending along the upper side of the basal half, and the remainder of the stalk has each alternate joint blackish; *quercicella* has simply "a black line above, terminating in black spots". In *quercicella*, the fore wings are "yellowish-brown, varied with blackish irregular striæ, chiefly from the costa, with a black dot on the end of the disk"; *faginella* agrees with this description, except that I should call the ground-color of the wings dull yellowish-ochreous, as they are likewise in the Missouri specimen; while in the Texas species the ground-color is paler, while the transverse stripes are more distinct, showing also a tendency to become more confluent, especially about the end of the disk, where they present to the naked eye something like a faint dark fascia; *faginella* has a more silky lustre than the other species, though this may be owing to the fact that the specimens are newer.

In the Texan specimens, and in that from Missouri, there is no spot at the end of the disk, and it is not distinct in *faginella*. In *quercicella*, "the posterior margin is tipped with blackish, and the cilia are yellowish-brown, containing two dark fuscous hinder marginal lines"; in *faginella*, there is a row of blackish spots around the apex, and a single faint brownish hinder marginal line in the cilia (which in the single specimen before me are a little injured). In the Missouri specimen, there are five very distinct blackish spots around the apex, and behind them in the cilia are two distinct, brownish, hinder marginal lines. Indeed, the cilia may be called brown, with a median, paler, hinder marginal line. Besides the five distinct spots, there are other very faint ones, and the brownish cilia are paler than the spots. The specimens from Texas agree in this respect with that from Missouri. One of these I sent to Mr. Cresson for comparison with Dr. Clemens's type of *quercicella* in the collection of the entomological section of the Phila. Acad. Sci. (formerly American Ent. Soc.). After comparing them, Mr. Cresson informs me that it "is not *Psilocorsis quercicella* Clem., which differs by having a rather broad, distinct, dusky border on the apical margin of the anterior wings, otherwise they look very much alike".

The species are all of very nearly the same size—about eight to nine lines in expanse of wings. Professor Zeller (Bei. z. Kennt. 1873, 40) identifies specimens received by him from Ohio and Texas with *quercicella* Clem. His Texan specimens were collected in the same region of the State from which I have received mine; and as in two collections that I have received from that region there is only one species, I think the probability is that *quercicella* Zell. (*nec* Clem.) is the same species that I have referred to above, and which I formerly identified with *faginella*, but which I now incline to consider distinct, and for which I suggest the name of *cressonella*. I, however, do this with some hesitation; for while, with the material before me, I consider the species distinct, I recognize the probability that, with fuller collections of bred specimens of all the supposed species, it is not improbable that they will be deemed at most only phytophagic varieties of a single species.

I am not sure but that the species described by me as *Gelechia dubitella* is properly referable to this genus.

C.? OBSCUROMACULELLA, *n. sp.*

The palpi in this species resemble those of *dubitella* above mentioned, and are more robust than in *quercicella*, *cryptolechiella*, &c., mentioned above.

Pale ochreous, so densely dusted with fuscous as to obscure the ground-color; on the fore wings the dusting is least dense along the fold and about the base. The spots on the wings are small, indistinct, and easily effaced; one of them is about the middle of the fold, and one near its end, one above the fold before the middle, one a little larger farther back, a small one at the end of the cell, and four or five indistinct ones are placed farther back, within, but parallel to, the apical margin. The basal half of the outer surface of the second joint of the palpi is brown; third joint ochreous; legs blackish-brown. *Alar expansion* about half an inch. Bosque County, Texas.

GELECHIA.

G. DISCONOTELLA, *n. sp.*

Palpi simple; second and third joints of equal length. Hind wings a little narrower than the fore wings, and rather deeply excised beneath the tip. Pale fuscous, or rather ochreous-yellow, irrorate with fuscous, with a faint silky-roseate hue, and with a longitudinal-elliptical brown spot at the end of the cell. Antennæ white, annulate with brown. Palpi brown, with the tip of the second joint white, and a wide band of the general hue on the middle of the third joint; legs brown on their anterior surfaces. Hind wings paler than the fore wings. *Alar expansion* three-eighths of an inch. Kentucky, in May.

G. SYLVÆCOLELLA, *n. sp.*

Allied to *bimaculella* Cham., but smaller, and with more of a purplish-bronze lustre. *Palpi simple. Hind wings as wide as the fore wings, and a little excised beneath the tip.* Palpi ochreous, with the base of the third joint, an annulus about its middle, and also an annulus about the middle of the second joint blackish. Antennæ blackish, faintly annulate with ochreous. Head pale ochreous, dusted above the antennæ with blackish scales. Fore wings and thorax blackish, microscopically dusted with ochreous, with a purplish-bronze lustre, with a white or pale ochreous spot on the fold beyond the middle, and with an ochreous or white fascia about the apical fourth concave toward the base, and widest on the costa, and sometimes interrupted about the middle. Cilia of a bluish-smoky hue. Hind wings a little paler than the cilia of the fore wings, and with paler cilia. Abdomen and legs ochreous, banded with fuscous. In addition to the marks on the fore wings above mentioned, there is sometimes another small white spot on the fold. Possibly it may be only a variety of *bimaculella*, but I believe it to be distinct. *Alar expansion* five lines. Kentucky.

In some specimens of *bimaculella* there is a small white spot on the fold before the usual larger one, and sometimes the fascia attains the dorsal margin. The head, too, is rather pale purplish, dusted with black, than "purplish-brown", as it is described originally.

G.? BOSQUELLA, *Cham.*

This species was originally (Can. Ent. vii. 92) referred to *Œcophora*. Afterward (Can. Ent. vii. 124) I transferred it to *Gelechia*. Having but few specimens, I have not examined the neuration, and its external characters leave me in doubt as to its real affinities. I am not sure but that the first reference to *Œcophora* is the best.

G. CRISTIFASCIELLA, *n. sp.*

Cell of hind wings closed, the wings scarcely emarginate beneath the tip; second joint of palpi thickened beneath, but scarcely brush-like ; third joint pointed, shorter than the second. Snowy-white; the head with a silvery lustre. Basal half of second joint of palpi and two rings on the third brown. Antennæ annulate with white and brown. Fore wings with a short brown dash just within the costal margin near the base, an oblique brown fascia of raised scales just before the middle and nearest the base on the dorsal margin, a small brown costal and opposite larger dorsal spot before the cilia, and a faint row of brownish spots around the base of the cilia. These marks on the upper surface show through on the lower, which is fuscous. Hind wings with a faint grayish tinge. Abdomen tinged with yellow. Legs brownish on their anterior surfaces. *Alar expansion* six lines. Kentucky, May 11, two specimens.

G. TRIOCELELLA, *Cham.*

Of this species, which was very abundant in Colorado, I have taken a single specimen in Kentucky. The Kentucky specimen is a trifle larger than those from Colorado. In the Colorado specimen, there are three ocellated spots on the fore wings, one of which shows indications of division. In the Kentucky specimen, it is completely divided into two spots. In the former, they consist of a black dot surrounded by a reddish-ochreous annulus; in the latter, the annulus is gray. These spots are very indistinct without the use of a lens.

G. QUINQUECRISTATELLA, *n. sp.*

This species has much the aspect of a *Laverna*. The second joints of the palpi are somewhat incrassate toward their apices, but not at all brush-like, and the third joint is much shorter than the second. The hind wings are wider than the fore wings, and emarginate beneath the apex.

Dark brown; the face and palpi and apical part of fore wings dusted with silvery-gray. On the fore wings, at about the basal one-third, are two raised tufts, one above, the other beneath, the fold; at about the middle is a single discal tuft, and at about the apical one-third are two others; cilia grayish-fuscous, dusted sparsely with hoary; hind wings fuscous, with stramineous cilia; abdomen dark brown; anal tuft yellowish. Legs and tarsi brown, annulate with white at the joints. The scales of the tufts are tipped with hoary, and the tufts nearest to the dorsal margin are placed a little behind the corresponding tufts. *Alar expansion* eight lines. The tuft on the middle of the disk is longer than either of the others, and appears sometimes as if there were two small ones confluent instead of one large one.

G. PALPILINEELLA?, *Cham.*

The species was described from Texan specimens in the Cin. Quar. Jour. Sci. ii. 252, which, appearing brown to the naked eye, show under a lens distinctly enough a white fascia before the cilia, which sometimes appears to be interrupted in the middle. I have taken at the light in Kentucky six specimens, which I mark with the ?, because, while they agree in all other respects with the Texan specimens, three of them show no indication of the fascia with or without a lens; while the other three, in place of the fascia, have a costal and opposite dorsal spot, visible to the unaided eye. Unless the palpi are observed, it may be mistaken for *G. palpianulella*.

G. 6-NOTELLA, *n. sp.*

Head and palpi white, except two annuli, one of which is at the base and the other before the apex of the palpi. Antennæ, thorax, and fore wings blackish-brown; about the basal one-fifth of the wing-length is an oblique white costal streak crossing the fold; farther back, about the middle of the costa, is a shorter one; and before the cilia is a still shorter one, pointing obliquely forward. These three streaks are all tipped with silvery scales, more abundantly on the first two than on the third. On the dorsal margin, respectively nearly opposite or a little before the first two costal streaks, are two tufts of silvery metallic scales; apex with a whitish spot and sometimes dusted with white. The cilia are paler and more grayish than the wings. Abdomen yellowish-white, the last segment stained with fuscous. Legs and tarsi white, banded with dark brown. *Alar expansion* half an inch. Bosque County, Texas.

G. INTERMEDIELLA, *n. sp.*

Intermediate between *roseosuffusella* Clem. and *rubensella* Cham., with one or other of which it has been heretofore confounded. The third joint of the palpi is longer and more acute than in *rubensella*, more like that of *roseosuffusella;* but the fore wings are much less roseate than in either of the other two species, frequently showing no tinge of the roseate hue; and, indeed, that hue when most distinct in it is but barely perceptible.

As in *rubensella* (and sometimes in *roseosuffusella*), the first dark band does not cover the base of the wing. The second band is like that of *roseosuffusella*, but the third extends across the wing, the dorsal portion being, however, paler than the costal, and the costo-apical part of the wing is ochreo-fuscous. In other respects, it resembles *roseosuffusella.* It is, however, darker and more grayish, less yellowish than that species. Bosque County, Texas.

G. LACTIFLOSELLA, *n. sp.*

Palpi simple; creamy-white, dusted with brown, with the outer surface of the second joint brown except at its tip. Basal joint of antennæ pale cream-color, stalk pale yellow. Thorax and fore wings pale cream-color, sparsely dusted with brown, with a small brown spot touching the fold above, near the base of the wing, another a little farther back, and yet farther back near the middle two spots, one on the fold, the other on the disk; sometimes these two last spots are confluent. There is a transverse brown streak at the end of the cell, and a distinct brown line curving around the base of the apical cilia; tip of thorax and a spot on each side before the tip brown. Hind wings and abdomen above white, tinged with silvery, and tuft creamy-white; abdomen beneath creamy, with a brown spot on each side of each segment. Legs creamy, sparsely dusted with brown, annulate with brown at the articulations, and with the tibia of the first and second pair brown. *Alar expansion* half an inch. Bosque County, Texas.

G. FUSCOTÆNIAELLA, *n. sp.*

Palpi simple. Hind wings excised beneath the tip. Snowy-white. Antennæ, apical half of thorax, base of fore wings, two small costal spots, and an apical spot brown; the second costal spot is larger than the first, which is placed about the middle of the costa. Abdomen whitish. Legs brownish-yellow on their anterior surfaces. *Alar expansion* four lines. Bosque County, Texas.

G.? MULTIMACULELLA, *n. sp.*

Hind wings not emarginate beneath the tip; palpi simple; third joint about half as long as the second.

Head, antennæ, palpi, and fore legs dark fuscous, the palpi tinged with ochreous. Fore wings sordid ochreous, covered with small fuscous spots, a row of which extends entirely around the margins of the wing. On the fold the spots are distinctly confluent. Intermediate and hind legs and tarsi and anterior tarsi fuscous, annulate with ochreous; abdomen fuscous above, whitish beneath. Some specimens are more ochreous than others. *Alar expansion* half an inch. Bosque County, Texas.

There is something about the species which suggests a resemblance to *Tinea* in ornamentation and in the form of the hind wings.

G. CRESCENTIFASCIELLA, *Cham.*

The crescentic fascia is always indistinct, and frequently not discernible, and sometimes in place of it there is simply a small, yellow, costal and opposite dorsal spot. The palpi are pale gray, brownish on the outer surface of the basal half of the second joint, and the tip of the third joint is brown. In some specimens, the wings are sprinkled with small blackish atoms.

G. (ERGATIS) PALLIDEROSACELLA, *n. sp.*

Palpi simple; pale grayish; second joint with thin brownish annuli, one near the base, one near the tip, and one on the middle; third joint, with base, tip, and an annulus between them brownish-gray. Head, thorax, and fore wings pale grayish, dusted with dark gray, and very faintly tinted with roseate; base of the costal margin, an oblique fascia behind it, and a little farther back, but still before the middle, an oblique costal band, extending to the fold, blackish-brown. Behind the last of these streaks, in the middle of the wing, is a short, blackish dash surrounded by a hoary or whitish annulus. Behind the middle is a costal, dark gray spot, opposite to which is a still smaller dorsal one, and opposite to the space between them is another blackish dash, the portions of the wing above and below which are but little dusted, while behind it the apical part of the wing is more densely dusted with brownish scales; cilia gray, with a darker basal line. Antennæ annulate with pale gray and dark brown; upper surface of abdomen and anal tuft pale luteous; legs brown on their anterior surfaces; tarsi annulate with brown and pale grayish-white. *Alar expansion* five lines.

Many specimens show no trace of the roseate hue. Bosque County, Texas.

G. OBSCUROSUFFUSELLA, *n. sp.*

Second joint of the palpi brush-like; hind wings scarcely emarginate beneath the apex.

White. Second joint of palpi brown on the outer surface at the base. Anterior wings suffused with pale fuscous on the disk and apex, with an indistinct whiter fascia before the cilia, slightly angulated posteriorly. Basal half of each segment of the tergum grayish; venter and anal tuft white; hind legs whitish; anterior and intermediate legs brownish on anterior surfaces; their tarsi annulate with white. *Alar expansion* half an inch. Bosque County, Texas.

G. OCHREOCOSTELLA, *n. sp.*

Palpi long, simple; third joint larger than second, acuminate. Hind wings faintly emarginate beneath apex.

Palpi ochreous; second joint suffused with fuscous on outer surface. Antennæ annulate with ochreous; inner surface of hind legs ochreous. *Extreme* costal margin ochreous. Insect otherwise brownish-gray, microscopically sprinkled with white scales. *Alar expansion* two-thirds of an inch. Bosque County, Texas.

G. CANOPULVELLA, *n. sp.*

Second palpal joint brush-like. Antennæ white, dotted above with brown. First and second pair of legs brown on their anterior surfaces, their tarsi annulate with white; base of extreme costa blackish. Insect otherwise hoary or whitish, dusted with bluish-gray, the dusting becoming more dense toward the apex of the fore-wings, with five or six rather indistinct grayish spots around the base of the cilia. *Alar expansion* a little over one-fourth of an inch. Bosque County, Texas.

G.? CILIALINEELLA, *Cham.*

The statement in the description of this species, that it is only microscopically distinguishable from *G. solaniiella*, is too broad, though the resemblance is very close. The palpi of this species resemble those of *Cleodora*, though the brush of the second joint of the palpi is smaller than in that genus. I have not examined the neuration, but I am inclined to transfer the species to *Cleodora*. The ornamentation is much like that of *C. pallidistrigella* Cham. and *C. pallidella* Cham. though the white streak on the fold and that on the disk which characterize those species are wanting in this, and in their place, or rather in place of their contained black streaks, there are in this species one or two small brown spots. It has the oblique costal and dorsal white streaks before the cilia as in those species, and behind them the short, white, costal streaks, but not the dorsal ones, and there is only one brown, hinder marginal line instead of three, and that one is indistinct.

CLEODORA.

C. PALLIDELLA, *Cham.*

This species was described from two specimens. On the receipt of a larger collection I find a greater amount of variation than I had looked for. The ground-color of the wings varies from ochreous-yellow to white, suffused with pale ochreous-fuscous. The palpi also vary in a similar manner, the outer surface being usually pale ochreous, dusted with fuscous. By a slip of the pen in the description I have stated that the brown spot is on top of the third joint; it should read second joint. The antennæ are fuscous, and the head and thorax are paler, more whitish than the fore wings; there is a white streak along the fold containing a blackish spot, and parallel to it is a discal, basal, white streak containing a black line or dash. The color of the wings deepens toward the apex, and just before the cilia are the long, oblique, costal and opposite dorsal white streaks mentioned in the description, and behind these are three short, white, costal and four dorsal streaks, the latter produced into the cilia, which are white, with three distinct, dark brown, hinder marginal lines, placed respectively at their base, middle, and apex; the legs are whitish, stained with fuscous on their anterior surfaces; and the *alar expansion* ranges from six to seven lines.

C. PALLIDISTRIGELLA, *Cham.*

This species is a little smaller than the preceding, ranging from five to six lines in *alar expansion*. The color of the head and appendages and the thorax resemble those of the preceding species, and it is fully as variable. The tegulæ and extreme base of the wings are white, the wings otherwise being much darker than in any of the specimens of the preceding species. They vary from orange-yellow to a dark yellow suffused with fuscous. The streak along the fold and the one above and parallel to it are indistinct, and their contained blackish spots are smaller, *while the costal margin from the middle to the cilia is white;* the costal oblique streak is much less oblique than in the preceding species, and *there are no costal spots behind it;* on the other hand, the dorsal oblique streak is more oblique, passing along the base of the cilia, into which it sends three white streaks. The differences above indicated by the *italics* induce me to consider the species distinct.

ANARSIA.

A. TRIMACULELLA, *Cham.*

I have taken this species also in Kentucky. It was described from Texas.

DASYCERA.

D. NONSTRIGELLA, *n. sp.*

This species differs from *D. newmanella* Clem., and from the two European species, not only by the absence of yellow marks on the wings, but still more by having the basal three-fourths of the antennæ densely clothed with scales; whereas in those species only a small portion is so clothed, and in this species the other fourth is also scaled, though not densely, and the scaling grows less and less toward the apex. It is described from a single ♀ taken resting on a leaf in the woods, June 30th.

Palpi yellow; under surface of third joint brownish. Face yellow, passing on the vertex into metallic yellowish-purple, if I may so describe an indescribable hue. Thorax and upper surface of fore wings rich brownish-purple; hind wings, abdomen, and under surface of fore wings purplish-brown (duller, more brownish, and less purple than the upper surface of fore wings); hind legs purple-brown, suffused with yellowish (other two pair rubbed in pinning). *Alar expansion* 6¾ lines. Kentucky.

BUTALIS.

B. **TRIVINCTELLA**, *Zell.*

I have bred great numbers of *B. matutella* Clem. It varies greatly from specimens indistinguishable from *B. immaculatella* Cham. to forms which I have described as *B. dorsipallidella* and *B. brevistriga*, and some specimens approach very nearly *B. trivinctella* Zell. I am much inclined to consider them all as varieties of one species. I have received *B. trivinctella* from Bosque County, Texas.

COLEOPHORA.

C. **TEXANELLA**, *n. sp.*

Palpi and antennæ simple. Inner surface of the palpi whitish; antennæ with alternate annulations of brownish-ochreous and white; abdomen brown above, a little paler beneath; hind wings fuscous. Outer surface of palpi, head, thorax, and fore wings rather dark ochreous, with two white lines on the fore wings obscured by dark brown dusting. One of these lines is on the fold; the other extends from the middle to the end of the disk. There is also a little brown dusting along the dorsal margin. Cilia of both pairs of wings grayish-ochreous. *Alar expansion* 5¼ lines. Texas, from Belfrage.

C. **CINERELLA**, *n. sp.*

Dark gray. Palpi and antennæ simple. Face and under surface a little paler than upper surface. *Alar expansion* 5½ lines. Kentucky, July.

C. **MULTIPULVELLA**, *n. sp.*

Palpi rather short, simple. Stalk of antennæ simple; basal joint tufted, white. Vertex and outer surface of palpi stained with brownish-ochreous, and the antennæ annulate with that color. Fore wings densely dusted with dark gray, so as to obscure the whitish ground-color; the dusting less dense beneath the fold, more dense toward the apex. Hind wings and upper surface of abdomen dark ochreous-gray; under surface of the abdomen white, dusted more sparsely with gray. Legs marked with dark ochreous-gray on their anterior surface. *Alar expansion* half an inch. At light in July. Kentucky.

C. **ALBACOSTELLA**, *Cham.*

By some inadvertence, I have omitted in the description of this species to state the ground-color of the fore wings. It may be called ochreo-fuscous or fusco-ochreous, with the base of the dorsal margin and the entire costal margin pale ochreous or whitish. Under the lens, very fine, narrow, whitish lines are seen marking the course of the veins. The outer surface of the palpi is fuscous.

C. **FUSCOSTRIGELLA**, *n. sp.*

Palpi and antennæ simple. Sordid ochreous. Second and third palpal joints each with a brown streak on their outer surface. On the for wings, the fold is marked by a narrow black line, and beneath and nearly parallel to it is a pale ochreous line. The base of the dorsal margin is pale ochreous, and it is microscopically streaked with white scales beneath the fold toward the cilia. Above the fold, the wing is somewhat streaked with fuscous. One of these streaks is short and narrow and near the apex; another, longer one, begins about the middle of the disk and goes to the apex. Nearer to the margin is another, which begins indistinctly near the base, but becomes wider and more distinct toward the apex; and another, still wider and more distinct, begins near the base, within the costal margin, and passes back to the cilia, being, however, interrupted beyond the middle by two narrow short ochreous streaks, which mark the position of two subcostal veinlets. The base of the costal margin is ochreous, and between the streaks the wing is ochreous. Legs and tarsi fuscous on their anterior, ochreous on their posterior surfaces. *Alar expansion* nearly half an inch. Bosque County, Texas.

C. BIMINIMMACULELLA, *n. sp.*

Antennæ and palpi simple. White, dusted, or, perhaps more correctly, suffused on the thorax and fore wings with pale fuscous. There is a small blackish spot on the fold at about the middle of the wing-length, and another at the apex of the fore wings. *Alar expansion* nearly half an inch. Bosque County, Texas.

C. QUADRILINEELLA, *n. sp.*

Sordid white, or white very faintly stained with ochreous. The markings are very indistinct. There are three pale ochreous lines, one within the costa, one on or just beneath the fold, and one along the disk, becoming fuscate about the basal third of the wing length, one of the branches going to the costal and the other to the dorsal margin, near the apex. Anterior surface of the legs and under surface of abdomen very pale fuscous. *Alar expansion* not quite four lines. Kentucky, in June. It requires care to distinguish the lines on the wings even in the most perfect specimens.

The larval case is two lines long, and bears some resemblance in form to that of *C. solitariella* as figured in Nat. His. Tin. iv., but is still more like that of *alcyonipenella* in Nat. His. Tin. v., having a clear shining shield covering its upper anterior portion. Food-plant unknown. Kentucky.

C. OCHRELLA, *n. sp.*

Basal joint of antennæ enlarged; second joint of palpi with a minute tuft. Fore wings dark ochreous, sometimes a little fuscous toward the tip; head, palpi, and thorax paler; hind wings what I should call leaden-ochreous; cilia of both pairs ochreous, and a little paler than the fore wings. Antennæ with alternate annulations of white and ochreous-brown. Abdomen of a dark leaden or slaty hue above, whitish beneath, with the tuft yellowish-white; legs brownish-ochreous on their anterior surface, whitish-ochreous behind. *Alar expansion* over five lines. Kentucky, in June. Larva unknown.

COSMOPTERYX.

C. 4-LINEELLA, *n. sp.*

This species departs so far from the usual type of structure, as well as ornamentation, that I hesitate a little about locating it in this genus. The fore wing is rather more caudate than it is figured for *C. drurella* in Ins. Brit. iii., or for *C. gemmiferella* by Dr. Clemens. The cell is acutely closed, and toward its end the subcostal and median veins each give off three branches; while the apical vein, after giving off two branches to the dorsal margin, and then one to the costal margin, continues through the long *cauda* to its apex.

The face, antennæ, and palpi are white, and also the head, which has a faint purplish tinge, and the antennæ and palpi are marked with longitudinal black lines. (These organs are slightly injured in the two specimens before me.) The legs also are white, the first two pair marked with black on their anterior surfaces; the hind legs only on the tibia. *Vertex, thorax, and basal half of fore wings dark fuscous*, with three white lines on the vertex (one on each eye and one on top); the wings with four white lines (one dorso-basal, one costo-basal, the other two on the disk, neither of them reaching the base, and the one nearest the costal margin being the longest); the costo-basal streak departs a little from the margin; all four streaks end abruptly with the basal brown part, and beyond it the wing is yellow—almost golden-yellow—with an oblique white line along the base of the costal cilia, and three smooth tufts of brilliant metallic scales, one of which is near the costa, another on the disk a little farther back, and the third is before the dorsal cilia. *Alar expansion* four lines. Bosque County, Texas.

ERIPHIA.

E.? ALBALINEELLA, *n. sp.*

Having but a single specimen, I have not examined the neuration, but it is otherwise so near *E. concolorella* Cham. in structure that I place it provisionally in this genus. Head and palpi blackish-brown, with a white line along the under surface of the palpi; antennæ white; thorax and fore wings blackish-brown, with a basal white streak on the wings extending the length of the fold; another white streak leaves the costal margin near the base, and passes obliquely backward almost to the fold, and thence on, nearly parallel with the fold, to the end of the cell, where it almost meets the apex of another shorter oblique costal streak (or rather an indication of one) before the costal cilia; cilia white, with a dark brown, hinder marginal line; hind wings and their cilia and the abdomen purplish-fuscous; anal tuft whitish; legs white, marked with dark brown on their anterior surfaces. *Alar expansion* four lines. Bosque County, Texas.

E.? NIGRILINEELLA, *n. sp.*

Of this also I have but a single specimen, and place it provisionally in this genus. The hind wings are a little wider than in the preceding species. Head and palpi white, except that the second and third joints of the palpi have each two small black dots on the outer surface; antennæ white. Thorax and fore wings white, with a short, blackish-brown, basal streak, which diverges from the costa, and nearly reaches the fold, and then passes backward, nearly parallel with the fold, nearly to the end of the cell and at a point nearly opposite to the beginning of another costal black streak placed just before the cilia, and which passes backward to the apex. The ornamentation of the fore wings is almost the reverse of the preceding species—white when that is black, black when that is white. Legs white, marked on their anterior surfaces with brown. *Alar expansion* three lines. Bosque County, Texas.

ELACHISTA.

E. TEXANELLA, *n. sp.*

Sordid pale yellowish-white, immaculate, or with faint fuscous microscopic dustings. *Alar expansion* nearly one-third of an inch. *E. parvipulvella* Cham. has wider wings, is more creamy-white, and is distinctly dusted with brownish-ochreous, and has the outer surface of the palpi brownish. In *texanella*, the neuration of the hind wings approaches that of *Cosmopteryx;* the subcostal vein passes straight through to the apical part of the wing, where it is deflected to the *dorsal* margin; it has no branches; the cell is unclosed; the median is furcate on the dorsal margin about the middle, and there are two independent discal branches, which are indistinctly continued through the cell. Submedian and internal distinct. Bosque County, Texas.

E. STAINTONELLA, *n. sp.*

White; the basal third of the costal margin of the primaries pale ochreous, dusted with fuscous; apical half of primaries pale ochreous, dusted with fuscous, with a narrow white fascia before the apex posteriorly angulated, or perhaps the wings are as well described as white with the apex, a wide irregular band just behind the middle (widest on the costa), and the basal third of the costal margin pale ochreous dusted with brownish; the cilia also are somewhat dusted. Hind wings pale fuscous, with pale ochreous or grayish-ochreous cilia. *Alar expansion* three lines. Texas.

Fore wings.—The subcostal vein goes to the apex, emitting three branches before the end of the cell, and becoming furcate before the apex; the median emits three branches before the end of the cell; and the fold is thickened. In the hind wings, the subcostal and median are each simply furcate.

TISCHERIA.

T. QUERCIVORELLA, *Cham.* Cin. Quar. Jour. Sci. ii. 109.

? *T. quercitella*, Frey, *nec T. quercitella*, Clem.

I have not seen the specimens from which Frey described his species nor the single imperfect one from which Clemens prepared his description. Frey thought his specimens belonged to Clemens's species; but Frey's description applies sufficiently well to the four ♂ and two ♀ before me, and which I cannot reconcile with Clemens's account of his species. In *quercivorella*, the face, palpi, and antennæ are *very pale* lemon-yellow, the vertex being darker—as dark as the fore wings. Clemens says of *quercitella*, "antennæ, head, labial palpi, dark orange-yellow". In *quercivorella*, the thorax and fore wings are lemon-yellow, with the costal margin more reddish, and becoming more so toward the apex, which is reddish-orange and somewhat dusted with darker scales. Clemens says of *quercitella*, "fore wings orange-yellow; apical portion reddish-brown, dusted with dark brown", and does not mention the reddish-orange hue of the costal margin. In *quercivorella* (both sexes), the dorso-apical cilia are paler than those of the apex, which, like those of the hind wings, and the entire hind wings themselves, except a fuscous patch at the base, are pale silvery-yellow; this fuscous patch and a similar one on the under side of the fore wings are peculiar to the male. In *quercitella*, Clemens says the hind wings are "pale yellowish, becoming reddish-brown toward the apex, and the apical cilia dark brownish". This does not apply to *quercivorella* at all. I have quoted the whole of Dr. Clemens's brief description.

In *quercivorella*, the under side of the wings is paler than the upper, and does not become darker toward the apex, but has the costal margin stained with fuscous on the fore wings. The thorax, abdomen, and legs are *pale* yellow, as also is the anal tuft; the front surface of the legs and the under side of the abdomen dusted with fuscous. *Alar expansion* scant three-eighths of an inch. Kentucky and Texas.

T. PRUINOSEELLA, *Cham.*

I have received slightly injured specimens from Texas which I refer to this species, which is heretofore recorded only from Kentucky.

T. LATIPENELLA, *n. sp.*

A single specimen (♂) received from Texas is pale yellow or luteus, becoming more orange toward the tip of the fore wings; the hind wings are paler than the fore wings and thorax, being, in fact, nearly white. There is a small fuscous patch on the under side of the fore wings; none on the hind wings. It is a little paler in color than *T. quercivorella* Cham., which it resembles in many respects, especially in size. But the striking peculiarity about it, that which gives it its distinctive character, is the extraordinary width and form of the hind wings. These, instead of being linear-lanceolate, and sharply pointed at the apex, as is usual, are fully as wide as the fore wings, and approach them in shape. The costal and dorsal margins are almost equally arched; each rounds off toward the apex almost equally at about the apical third of the wing, and the apex is rather obtuse. They are very unlike anything else I have met with in the genus; and if the species had been previously described, I think they could not have been overlooked. The specimen was not pinned when I received it, and therefore I cannot suspect that it was a manufactured species. It belongs no doubt to the Oak-feeding group.

Possibly it may be *T. zelleriella* Clem., which I have not seen. Dr. Clemens says, "Hind wings bluish-gray, tinted with yellow externally toward the tip." "Bluish-gray" would hardly describe the color of the hind wings, which are of a very pale whitish-yellow; but this is the only *Tischeria* that I have seen which has the "hind wings tinted with yellow" along the costal margin "toward the tip". But if it is that species, it is strange that Dr. Clemens has not directed attention to the extraordinary width of the hind wings and their comparatively rounded apex.

As above stated, I have but a single ♂ and no ♀. Dr. Clemens's description of the ♂ applies well enough, except in the particulars just stated; but he describes the supposed ♀ of *zelleriella* as something quite different, and he bred *zelleriella* from mines on the upper surface of Oak leaves. I have another species which I have labelled *zelleriella?*, and which I have bred frequently from mines on the upper surface of Oak leaves. This species agrees with Dr. Clemens's account of *zelleriella*, except that the hind wings are *not* tinted with yellow, as above described in the ♂, and the hind wings of the ♂, if they can be called bluish-gray, are *very* pale. The ♀ agrees better with Clemens's description of *zelleriella* ♀.

In this species, the abdomen is fuscous, the anal tuft yellow; there is no fuscous spot on the under surface of either pair of wings in either sex; the legs, palpi and face, and antennæ are very pale lemon or whitish-yellow. In the ♀, the fore wings are deep saffron or almost reddish-yellow, becoming deeper and more purple toward the apex, with the dorsal cilia paler; hind wings and cilia leaden-gray. The ♂ differs by being much paler yellow on the fore wings, and the hind wings are also paler and wider; though not nearly so wide, and tapering much more gradually to the acute apex, than in *latipenella*, with which it otherwise agrees, except that it lacks the yellow tint along the apical part of the costa. It also differs from the ♂ by having the abdomen yellow instead of fuscous. The mine also seems to differ from that of *zelleriella*, being whitish, elongate, rather narrow, and the cuticle contracted, and it is placed indifferently at any part of the upper surface, whereas Dr. Clemens states that the mine of *zelleriella* is at first a white blotch, but subsequently becomes brown, *and the margin* of the *leaf is curled*.

I have known this species for years, but hesitated to describe it as new, lest it might prove to be *zelleriella*. I am, however, pretty well convinced that it is new, and suggest for it the name *T. clemensella.* It is the same species referred to by me as *T. zelleriella?* in Cin. Quar. Jour. Sci. ii. 110 (April, 1875). So far as I have been able to learn, there is no authentic specimen of *zelleriella* now extant, and we must content ourselves with Dr. Clemens's brief description.

Messrs. Frey and Boll describe a species as *zelleriella* Clem., suggesting the name *complanoides* for it if it should prove distinct from *zelleriella.* It is impossible to say whether *complanoides* = *zelleriella* or not; but *complanoides* has "the antennæ, head, and breast vivid egg-yellow, of the same color as in the European species (*complanella*), and the fore wings of the same color". In *clemensella,* the face, palpi, breast, and legs are paler than the fore wings, even in the ♂, and very much so in the ♀; and, as I understand the description of *complanoides,* the base of the hind wings is darkened, which is not the case with this species. I do not recognize any species that I have seen in Dr. Clemens's account of *zelleriella,* nor in that of *complanoides* by Frey and Boll.

T. ÆNIA, *Frey & Boll.*

In a paper in the Cin. Quar. Jour. Sci. i., I denied the distinctness of this species, which mines the leaves of *Rubus villosus,* from *T. malifoliella* Clem., which mines Apple leaves. The species had been long known to me before it was described by Frey and Boll as *T. ænia,* and was referred to by me (*loc. cit.* iii. 208) as identical with *malifoliella.* I am not now so certain that it is identical, and probably the greater number of entomologists would concur with Frey and Boll in regarding it as a new species, or a phytophagic species or variety; and yet the only constant or material difference that I have observed is that *T. ænia* is of a richer bronzed-brown, while *malifoliella* is of a duller dead brown. I have received from Mr. Belfrage, from Texas, a single specimen in good condition, and now in the museum at Cambridge, labelled *T. ænia?,* the food-plant of which is unknown, and which seems to me to bear about the same relation to the Blackberry species that the latter does to the species from the Apple; that is, it is of a brighter, more brassy lustre than *T. ænia* from the Blackberry. It is a little smaller than *T. ænia* and *T. malifoliella,* which are of nearly the same size, and the face and palpi are of a different hue. It will probably prove to be a new species. They may all be regarded as "phytophagic species".

T. PULVELLA, *n. sp.*

Antennæ pale ochreous; vertex whitish, stained with ochreous; face and palpi white; thorax and fore wings white, suffused with pale ochreous, and *densely* dusted with ochreous-fuscous, paler and less dusted beneath the fold; hind wings and cilia pale lead-color; under surface of fore wings ochreo-fuscous, that of the hind wings whitish; both wings wide for this genus. Abdomen whitish, dusted with fuscous; anal tuft yellowish-silvery; legs yellowish-white. *Alar expansion* four lines. Texas.

LITHOCOLLETIS.

L. NECOPINUSELLA, *n. sp.?*

The nearest American congeners of this species are *L. cratægella* Clem. and *L. hageni* Frey. The latter I know only through Professor Frey's description. *Possibly* the insect before me may be that species, though I am unable to detect any trace of saffron-yellow in the ground-color of the fore wings, which are dark golden-brown; the third dorsal spot, which seems to be distinct in *hageni*, is here only indicated by its dark margin, there being no white scales; and the two last costal streaks do not cross the entire wing as they do in *hageni*, if I understand Professor Frey's description of that species.

It cannot be mistaken for *cratægella* Clem., because the thorax and basal portion of the fore wing (except the costal margin) are white here, while in *cratægella* they are golden-brown (marked, however, by median and dorsal basal white streaks, which are frequently continued on to the thorax); the face and palpi are here pure white, and the upper side of the antennæ is darker fuscous than in *cratægella.* (Dr. Clemens's description of *cratægella* is not very accurate. He says, "Antennæ, tuft, and front dark silvery-gray." I should call the face and under side of the antennæ silvery-white, while the tuft is rather a brownish than a silvery gray. He makes no mention whatever of the white streak which extends along the base of the dorsal margin as far as the basal fourth of the wing-length, nor of the apical black spot; and what he describes as "the streak of black scales *in the middle* of the wing *at the apex*, extended backward between the streaks as far as the second dorsal and costal streaks", is only the extended dark margins of the costal and dorsal streaks, and frequently extend back to the apical spot.)

This species is also larger than *cratægella*, having an *alar expansion* of over four lines, whilst *cratægella* varies from scarcely three to something over three and three-fourths; the third dorsal streak in *cratægella*, though small, is distinct, while in this species it is only indicated by its dark margin; in this species, too, the dark margins of the first costal streak are produced to the base of the wing, the anterior dark margin separating the narrow golden-brown basal portion from the wide white portion, and the posterior dark margin extending along the extreme costa. The second costal streak is a little more oblique in this species than in *cratægella*, while the fourth is perpendicular to the margin here, and points obliquely forward in *cratægella.* In this species, too, there is a brown ciliary apical streak extending out from the apical spot—something like the hook in some species of *Gracilaria*—and this is the only American *Lithocolletis* thus far seen by me which possesses this peculiar mark; the dorsal cilia are also tipped with brown; all the dark marks of the wings shine with a peculiar bluish-black lustre. But in all other respects the fore wings seem to be marked exactly as in *cratægella;* that is, the ground-color is brownish-golden, and the position and number of the marginal streaks are the same—three dorsal and four costal, the third dorsal minute, the second large, and the first very large, and the first costal very oblique. In this species, however, these marginal streaks are dark-margined on both sides, while in *cratægella* it is only the first costal and first and second dorsal that are so margined, the others only dark-margined before. Apical spot circular, and hinder marginal line, as in *cratægella*, at the base of the cilia.

The hind wings and cilia dark lead-brown—darker than in *cratægella*. Abdomen fuscous, a little paler beneath, and tuft yellow. Legs and tarsi white, marked on the anterior surfaces with brown. Kentucky, early in May.

L. POPULIELLA, *n. sp.*

I have bred a few species from small tentiform mines on the under side of leaves of the Silver-leaf Poplar, which, though very distinct from *argentinotella* Clem. and *L. fitchella* Clem., I place in the same group with them. It is perhaps nearer to *L. carpinicolella* than to any of the other species figured in the Nat. Hist. Tin.

Palpi, head, tuft, antennæ, under surface of thorax, legs, and abdomen pure snowy-white; upper surface of abdomen and fore wings pale golden: there are three white longitudinal streaks on the thorax (one median, and continuous with a dorso-basal white streak on the wings, the other two passing over the tegulæ* and continuous with a median basal white streak on the wings); there is also a costo basal white streak on the fore wings, and these three basal wing-streaks are of about equal length, and less than one-fourth of the length of the wings. Immediately behind the dorso-basal streak, and scarcely distinct from it (probably sometimes confluent with it), is the first dorsal streak, which approaches a square form, and is dark-margined before and above. Almost opposite to this dorsal streak, but a little behind it, is the first costal streak; it is oblique, not pointed, and is dark-margined before. The second costal and second dorsal are opposite each other, the costal one being the largest of the two, triangular and dark-margined before. The third costal and third dorsal are nearly opposite, the costal being perhaps a little farther back, and being larger than the dorsal, and larger also than the second costal; both are dark-margined before. These are only the three dorsal streaks. The fourth costal is just before the apex, points a little obliquely forward, and is margined behind by a small apical patch of brown dusting. Cilia white, with a brownish hinder marginal line at their base. *Alar expansion* one-fourth of an inch. Ohio and Kentucky.

L. BIFASCIELLA, *n. sp.*

Tongue, palpi, and face silvery-white, the outer surface of the third joint of the palpi brown toward the tip, and the forehead tinged with

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*Following Burmeister, I have sometimes called these organs "patagia".

saffron. Tuft pale saffron, darker toward its sides. Antennæ silvery-white beneath, shining brown above. Thorax and fore wings deep reddish-saffron, with two silvery-white fascia on the wings, dark-margined behind, each of which is nearly straight, one placed at about the basal third, the other behind the middle: immediately before the cilia are a costal and an opposite dorsal silvery-white streak, also dark-margined behind; apex densely dusted with brown, forming a large spot, which has a few white scales before it and others intermixed; cilia saffron, tipped with silvery-gray, and with a dark brown, hinder marginal line before the tips. Hind wings and upper surface of the abdomen dark fuscous. Under surface of the abdomen silvery-white, with a large yellow spot on each side of each segment, and one on the under surface of each of the last three or four joints: anal tuft yellow, tipped with silvery. First (and second?) pair of legs brown on their anterior, white on their posterior surfaces; the tarsi annulate with white; hind legs white, the tarsi annulate with fuscous, and a pale saffron spot on the outer surface of the tibia. *Alar expansion* scant four lines.

Described from a single ♀ bred from a long, rather wide, and irregular mine on the upper surface of a leaf of the White Oak (*Q. alba*). The pupa was concealed under a white, silken web over the midrib, and the larva is unknown.

It bears an evident, though not very close, relationship to *L. obstrictella* Clem.; but in the latter, instead of the costal and dorsal spots before the cilia, there is a white fascia. But this alone would not be necessarily of specific value. The streaks are, however, a little differently placed; and *obstrictella* has a whitish band near the tip of the antennæ, which is absent in this species; and Dr. Clemens makes no mention of the brown outer surface of the third joint of the antennæ, nor of the yellow spots on the abdomen. He simply says, "abdomen black", and makes no mention of the palpi. But there is a more decided difference. The larva of *obstrictella* belongs to the cylindrical group, and makes a tentiform mine on the under surface of leaves of "the Black Oak" (*Q. tinctoria?*). This mine is on the upper surface of White Oak leaves, and though the larva is unknown, the character of the mine indicates that it belongs to the "flat" group. There are other differences, but these here indicated are sufficient.

As compared with *L. tubiferella* Clem., to which the mine and the imago bear some resemblance, it is deeper reddish-saffron than *tubiferella*, which also has the tuft white, has no dorsal and no costal streak behind the fascia, and the apex is not dusted. It is more like *L. guttifinitella* Clem., or rather it is between *obstrictella* and *guttifinitella;* but the latter always has the first fascia oblique toward the base of the costa, the costal and dorsal spots in the apical part of the wing pointing obliquely backward and smaller, and the dusting is scattered along the base of the cilia, rather than, as in this species, forming a spot which is white-margined before. By these characters, also, *guttifinitella* may be distinguished from *cincinnatiella* Cham., though perhaps one might not find much difference in the published descriptions. *L. cincinnatiella* is also more golden than saffron, with the dusting of the fasciæ produced back along the middle of the wings. There are also other minute differences between the species mentioned, and there is no difficulty in distinguishing bred specimens.

L. AUSTRALISELLA, *n. sp.*

No basal streak nor apical spot on the fore wings, which are pale golden (about the color of *L. argentinatella* Clem.). There is no distinct hinder marginal line in the pale yellow cilia. The marks on the wings are, first, a small, white, dorsal streak; then an oblique, white, costal streak about the basal third of the wing-length; a silvery-white fascia about the middle, which is posteriorly angulated nearer to the costal than to the dorsal margin; a small, silvery-white, costal spot immediately before the cilia, and a longer dorsal one opposite to it, extending obliquely backward; all of these marks are posteriorly dark-margined, the dark margin of the last costal and dorsal streaks almost meeting in the apical part of the wing; apex dusted with dark brown on a white ground. Thorax pale golden, with a white streak from its anterior margin to the apex. Head, tuft, palpi, and antennæ silvery-white, each joint of the antennæ dotted above with brown, and the basal joint pale golden above. Under surface of body, wings, and legs pale luteous, the legs stained with brownish on their anterior surfaces. *Alar expansion* three lines and one-half. Bosque County, Texas.

L. BICOLORELLA, *n. sp.*

Specimens of this species were bred by me three years ago from flat mines and larvæ, on the upper surface of leaves of *Quercus bicolor*, and, without sufficient examination, were labelled in my cabinet "*L. ulmella*". I am now satisfied that they are distinct species, though closely related; *bicolorella* is between *basistrigella* Clem. and *ulmella* Cham. The stripe along the dorsal margin of the primaries, which in *basistrigella* only extends about or but little over one-half of the wing-length, in *bicolorella* extends to the cilia, and in *ulmella* it is deflexed along the base of the cilia to the apex, and the oblique dorsal streak, which in *basistrigella* is placed at the end of the dorsal basal streak, is absent in both the other species. In this species there are two costal oblique streaks placed almost as in *ulmella*, which has three, and behind these two streaks there are three small white dots within the margin, and one of them touching the brown dusting which is placed along the base of the dorsal cilia, and the second costal streak has the tip margined with brown dusting. The wings, both in this species and in *ulmella*, are perhaps better described as yellowish-saffron than as pale golden. The head and palpi are white, the tuft with a little yellowish intermixed, and the antennæ also are annulate with brown, as in *ulmella*. The abdomen is paler yellow than the wings, and tinged above with fuscous, and on the upper surface of the thorax has a white line from its anterior margin to its apex (*ulmella* also has this line sometimes). *Alar expansion* as in *ulmella*. Kentucky.

ACANTHOCNEMES, *gen. nov.*

The species on which I found this genus is very near to *Phyllocnistis* Zell. As in that genus, the posterior tibiæ are set around with spines or bristles, which in this species are also found on the basal tarsal joint (hence the generic name). It differs from *Phyllocnistis* as follows: the face is wider in proportion to its length, the antennæ are much shorter, and the basal joint smaller, while the stalk is serrated toward its apex. *The maxillary palpi are well developed, being as long as the first and second joints of the labial pair.* In the dead insect, both pairs droop. The anterior wings are more decidedly caudate than in *Phyllocnistis;* more so in fact than in any species known to me, unless it be some species of *Cosmopteryx;* and the neuration, while resembling that of *Phyllocnistis* more nearly than any other genus, is yet sufficiently distinct from it. The costal vein is short and indistinct; the subcostal is also very indistinct, and appears to run straight through the wing to the margin before the apex. The median vein, however, is *very* distinct, running through the middle of the wing and gradually disappearing in the "cauda" or produced apex, just before which it gives a branch to the *costal* margin; cell unclosed (?) (or discal vein oblique and subobsolete); there appears also to be a *very indistinct* branch from the median to the dorsal margin before the distinct one to the costal margin, so indistinct, indeed, that I am not sure that it represents a vein at all; submedian tolerably distinct. Hind wings linear with the costal; submedian (?) and internal veins moderately distinct; the subcostal, obsolete at its base, becomes gradually more distinct as it passes to the extreme apex of the wing. Cilia of both wings long.

As I have examined the neuration of only a single specimen, and a single wing only of each pair, it may prove to be more distinct than I have found it.

As shown by the following description, the ornamentation, while to some extent resembling that of *Phyllocnistis*, is yet of a different pattern.

A. FUSCOSCAPULELLA, *n. sp.*

Head, palpi, basal antennal joint, anterior half of the thorax, and fore wings except at the base, silvery-white, *faintly* tinged with yellowish. Base of the fore wings and apical part of thorax fuscous. Antennal stalk yellowish. The brown base of the fore wings is posteriorly margined by a narrow fascia of a more pure silvery-white than the remainder of the wings. Legs yellowish-fuscous on their anterior margins. *Alar expansion* a little over three lines. Bosque County, Texas.

PHYLLOCNISTIS.

P. ERECHTITISELLA, *n. sp.*

Only the mine and larva are known. I have not succeeded in rearing the imago. I have known the mine for many years, but believed it to be Dipterous until the fall of 1876, when I found specimens containing the larva and others with the empty pupa case projecting from the mine. Kentucky.

NEPTICULA.

N. QUERCIPULCHELLA, *n. sp.*

Closely allied to *unifasciella* Cham. and equally as pretty. The larva is bright green, with a deeper green line of contents; it makes a long, narrow, winding, and gradually widening track, similar to that of *N. quercicastanella* Cham. in leaves of *Quercus alba*, and is, I believe, the only species of the genus which leaves an old mine to make a new one. From the structure of *Nepticulæ* larvæ this would seem hardly possible, but I do not know how otherwise to explain the fact that I have taken a leaf containing a mine more than half finished, and which had evidently been but a little while unoccupied; and on the same leaf, not an inch distant from it, was a new mine just begun, and yet containing a large larva almost fully grown, and which had evidently just reëntered the leaf; the mine not being more than twice as long as the larva, and in size answering exactly to the terminal portion of the empty mine, and being in all respects exactly like it. After continuing to feed until the new mine was something more than half an inch long, the larva left it, and spun its cocoon on the earth in the bottom of the breeding jar, and I bred the imago from it. The larva was well grown, certainly several days old, when it began the new mine, and *came from somewhere*, whether or not it came from the empty mine in the same leaf. The mine, larva, and insect are larger than in *quercicastanella*.

The head is black; antennæ fuscous; occiput, eyecaps, palpi, and feet yellowish-white, silvery; thorax and fore wings deep blue-black (I think so, though it is exceedingly difficult in so small and resplendent a creature to get the correct hue), bronzed, and with purple and violet reflections; the fascia is behind the middle, silvery-white, and a little widest on the dorsal margin, and the wing behind the fascia is darker than before it, whilst the cilia are paler and less lustrous than the wing; under surface of fore wing; cupreus-black, as also are the abdomen and legs. *Alar expansion* two lines. Imago, June 19, after only a week in the pupa state. Kentucky.

N. JUGLANDIFOLIELLA, *n. sp.*

Dr. Clemens gave this name to a mine and larva observed by him in Walnut leaves; and as his description *of the mine*, as far as it goes, answers to the mines from which I bred this species, I adopt the name. I have, however, nearly always found several mines in the same leaflet at the same time, and very much contorted and frequently crossing each other. I did not observe that the larvæ differed from other *Nepticulæ* larvæ, though Dr. Clemens mentions its resemblance to the larva of a Dipteron. The mines are common in the latter half of June, and the moths emerge about the 1st of July. Dr. Clemens found some empty mines and some larvæ in August.

The imago resembles that of *quercipulchella* Cham., but is less resplendent and smaller, scarcely measuring two lines in *alar expansion*. The occiput, eyecaps, and palpi are silvery yellowish-white; the head brownish rusty-red; antennæ fuscous; fore wings dark purple-brown, nearly black, but strongly purplish, with the cilia paler, and a pale golden or rather yellowish-silvery fascia behind the middle, which has its posterior margin straight and its anterior slightly concave. The first and second pairs of legs are silvery yellowish-white, and the third pair is of the same hue with the fore wings, with the basal joints paler, and of the same hue with the under surface of the abdomen. Kentucky.

N. LATIFASCIELLA, *n. sp.*

Face pale rusty-yellowish; vertex dark brown; palpi and basal joint of antennæ (eyecap), thorax, a broad fascia about the middle of the fore wings, and the cilia silvery-white, tinged with pale yellowish (except the cilia). The tuft is rather small, the antennæ are pale grayish-fuscous, tinged with silvery; the fascia is very broad, nearly straight on its anterior and convex on its posterior margin; the costal cilia are fuscous; upper surface of abdomen fuscous, lower pale grayish-fuscous, and the legs darker fuscous. *Alar expansion* two lines.

As will be evident on comparison of this description with that of *N. nigriverticella* Cham. in Cin. Quar. Jour. Sci. ii. 118, there are many points of close resemblance between them, although they are very distinct species. It was taken resting on the trunks of Chestnut-trees (*Castanea americana*), the leaves of which were full of empty *Nepticula* mines, about the middle of August. Kentucky.

N. BOSQUELLA, *n. sp.*

Palpi and eyecaps white; antennæ yellowish-fuscous; head deep black; thorax and fore wings pale creamy-white, dusted rather densely with fuscous; hind wings and cilia of both pairs yellowish-silvery; abdomen brown on top; anal tuft yellowish-white; anterior and middle legs brown on their anterior surfaces; hind legs and under surface of abdomen pale creamy-yellowish. *Alar expansion* four lines. Bosque County, Texas.

ART. IV.—TINEINA AND THEIR FOOD-PLANTS.

By V. T. Chambers.

The following is intended as a catalogue of plants which are fed upon by the *Tineina* within the limits of the United States and Canada so far as they are at present known.

The best descriptions of these insects may fail to enable one to identify captured species, when, as frequently happens, two or three minute species differ only in a shade of color, or in the presence or absence of a mark of microscopic dimensions; but when the larvæ, food-plants, and modes of larval and pupal life, with the character of the mines in mining species, are known, there need be little difficulty in recognizing bred specimens. With knowledge of an insect in these particulars, even a very imperfect description of the imago will usually enable us to recognize a species which has been bred from the larva, for although two species may resemble each other so closely that even the best written description may not enable us to determine which of the two it is, yet it will be a very rare occurrence that this close resemblance will hold good throughout its history as larva and pupa, including its food-plant, mode of feeding, larval case, or mine, or burrow, or mode of sewing or folding leaves, mode of pupation, cocoons, &c. The case is very rare that in all these respects two species approach each other so clo ely that nothing distinctive and clearly marked is left of either. Yet, rare as they are, cases do sometimes occur where we are still left in doubt as to the distinct specific characters even of bred specimens, as, for instance, it may yet be considered doubtful whether *Aspidisca splendorifuella* Clem., *A. juglandiella* Cham., *A. diospyriella* Cham., and the species mentioned by Mr. Stainton as having been found by Lord Walsingham mining Poplar leaves in Oregon, are distinct species, the chief reason for considering them distinct being the difference in food, it being a very unusual thing to find one of these little leaf-mining species feeding on so many and diverse plants.

As to a great majority of the species, we are ignorant what they feed upon or whether they feed at all in the imago. With the exception of half a dozen species mentioned hereinafter, I have never seen any of these little species feeding upon anything except in the larval state.

It is to aid in the identification of species that this catalogue has been prepared. A species having been bred, and the food-plant thus known, and its characters as larva or pupa, and its mode of feeding, character of mine, &c., having been noted, and, better still, if it be recognized as belonging to any established genus, a reference to the catalogue will give the names of the species known to feed upon that plant; and a reference to the published accounts of those species will usually enable one to determine whether the species is new, or to recognize it if already made known.

When only the larva is known, that fact is distinctly stated; when the food of the imago is known, that also is distinctly stated. In all other cases, the remarks refer to the food-plants of larvæ of which the imago also is known; and when the larva is a leaf-miner, the surface (upper or lower) mined is stated.

MAGNOLIACEÆ.

MAGNOLIA UMBRELLA (and probably some other Magnolias).

The larva of *Phyllocnistis magnoliæella* Cham. makes a long, winding, linear, mine on either surface of the leaves. The imago is unknown, and it may prove to be *P. liriodendronella* Clem.

LIRIODENDRON TULIPIFERA. Tulip-tree.

The larva of *Phyllocnistis liriodendronella* Clem. makes a long, winding, linear mine on either surface of the leaves.

CRUCIFERÆ.

BRASSICA OLERACEA.

The larva of *Plutella cruciferarum* feeds on the under side of the leaves of Cabbage and some other plants of this order.

TILLIACEÆ.

TILLIA AMERICANA. Basswood or Linden.

Lithocolletis lucetiella, Clem. Larva in tentiform mine in under surface of leaves.

L. tilliæella, Cham. Larva in tentiform mine on upper surface of leaves.

Coleophora tilliæfoliella, Clem. Larva only is known. It lives in a case and feeds on the under side of leaves.

ANACARDIACEÆ.

RHUS, *sp.?*

Chrysocoris erythriella, Clem. The larva feeds on the fruit-racemes.

RHUS TOXICODENDRON. Poison Oak or Poison Ivy.

Lithocolletis guttifinitella, Clem. The larva feeds in a flat blotch mine in upper surface of the leaves.

Gracilaria rhoifoliella, Cham. Larva at first mines, and then feeds externally, rolling the leaf.

RHUS, *sp.*

Gelechia rhoifructella Clem. Larva feeds on fruit-racemes.

Gracilaria rhoifoliella, Cham. Larva feeds as in *R. toxicodendron* (*supra*).

VITACEÆ.

VITIS. Various species of Grape.

Phyllocnistis vitigenella, Clem.
Phyllocnistis vitifoliella, Cham.
Larvæ make long, linear, winding mines in upper surface of leaves.

Antispila issabella, Clem.
Antispila viticordifoliella, Clem. & Cham.
Antispila ampelopsifoliella, Cham.
Larvæ in blotch mines in upper surface of leaves, cutting out cases, in which they pass the pupa state on the ground.

AMPELOPSIS QUINQUEFOLIA. Virginia Creeper.

Phyllocnistis ampelopsiella, Cham. Larva in a white, convoluted mine on under (*very* rarely also on upper) surface of leaves.

Antispila ampelopsifoliella, Cham. Larva in flat blotch mine in upper surface of leaves, cutting out a case in which it pupates on the ground.

SAPINDACEÆ.

ÆSCULUS GLABRA. Buckeye, or Horse Chestnut.

Lithocolletis guttifinitella, Clem., var. *æsculisella*, Cham. Larva in flat blotch mine in upper surface of leaves.

ACERACEÆ.

ACER SACCHARINUM. Sugar Maple.

Lithocolletis aceriella, Clem. Larva in a flat blotch mine in upper surface of leaves.

Lithocolletis lucidicostella, Clem.
Lithocolletis clemensella, Cham.
Larvæ in tentiform mines in under surface of leaves.

Gracilaria packardella, Cham. Larva rolls the leaf downward into a conical figure.

Incurvaria acerifoliella, Fitch. Larva in a blotch mine, from which it cuts out a case.

Catastega aceriella, Clem. Larva only is known. It at first mines the leaf, and afterward constructs a case of its "frass". (Does not belong to *Tineina?*)

ACER GLABRUM. Mountain Bush Maple.

Gracilaria acerifoliella, Cham. Larva curls the edge of the leaf down into a cone.

NEGUNDO ACEROIDES. Box Elder.

Gracilaria negundella, Cham. Larva curls down the edge of a leaf.

CELASTRACEÆ.

EUONYMUS ATROPURPUREUS (and other species?). Indian Arrow Root or Burning Bush.

Hyponomeuta evonymellus, Schop. Larvæ social in a large web, feeding on leaves.

H. wakarusa, Gaumer (? = *H. evonymellus*).

CELASTRUS SCANDENS. Bitter Sweet, or Staff-tree.

Adela bella, Cham. Imago on the flowers in May and June. Larva unknown.

LEGUMINOSÆ.

GLEDITSCHIA TRIACANTHUS. Honey Locust.

Laverna? gleditschiæella, Cham. Larva burrows in the thorns.

Helice pallidochrella, Cham. }
Agnippe biscolorella, Cham. } The larvæ of these species no doubt feed *in some way* on this tree. A larva (of one of them?) feeds in the "honey" inside the seed-pods.

CERCIS CANADENSIS. Judas-tree, or Redbud.

Gelechia cercerisella, Cham. Larva sews together the leaves.

THERMOPSIS FABACEA *var.* **MONTANA.**

Gracilaria thermopsella, Cham. Larva in a flat, irregular mine in upper surface of leaves.

DESMODIUM, *sp.?* Tick Trefoil.

Lithocolletis desmodiella, Clem. Larva in a small tentiform mine in under surface of the leaves.

Gracilaria desmodifoliella, Clem. Larva at first mines, and then rolls the leaf.

Gracilaria (Parectopa) robiniella, Clem. Larva in a flat, digitate mine in upper surface of leaves.

Gelechia desmodifoliella, Cham. Larva only is known. It feeds on the flowers.

Gelechia, sp.? The larva only is known. It feeds in a silken tube on the under side of the leaves.

LESPEDEZA, *sp.?*

Gracilaria (Parectopa) lespedezæfoliella, Clem. Larva in flat, acutely digitate mine in upper surface.

TRIFOLIUM PRATENSE. Red Clover (and other species?).

Gelechia roseosuffusella, Clem. Larva mines the leaves.

Anaphora agrotipennella, Grote. Larva feeds in clover-sod.

AMORPHA FRUTICOSA. False Indigo.

Walshia amorphella, Clem. Larva burrows in the stem.

Lithocolletis amorphæella, Cham. Larva in tentiform mine on under side of leaves.

Gelechia amorphæella, Cham. Larva sews together the terminal leaves.

ROBINIA PSEUDACACIA. Black Locust.

ROBINIA VISCOSA. Clammy Locust.

ROBINIA HISPIDA. Rose Acacia.

Lithocolletis robiniella, Clem. Larva in white tentiform mine on both surfaces of the leaflets.

Lithocolletis ornatella, Cham. Larva in yellowish blotch mines on both surfaces.

Gracilaria (*Parectopa*) *robiniella*, Clem. Larva in flat digitate mines on upper surface.

Gelechia pseudacaciella, Cham. Larva feeds externally on the leaves and also in the mines of *Lithocolletis robiniella.*

Xylesthia clemensella, Cham. Larva bores in dead Locust timber, posts, &c.

AMPHICARPÆA MONOICA. Hog Peanut.

Lithocolletis amphicarpeæella, Clem. & Cham. Larva in white tentiform mine in under surface.

Leucanthiza amphicarpeæfoliella, Clem. Larva in flat mine in upper surface.

GLYCYRRHIZA LEPIDOTA. Licorice-plant.

Gelechia glycyrrhizæella, Cham. Larva sews together the terminal leaves.

ROSACEÆ.

CERASUS SEROTINA. Wild Cherry.

Lithocolletis cratægella, Clem. Larva in tentiform mine in under surface of leaves.

Aspidisca splendoriferella, Clem. Larva in a minute flat mine in August, and later cuts out a case, in which it pupates.

Ornix prunivorella, Cham. Larva at first in a tentiform mine in under surface of leaves, at the margin; leaves the mine to pupate.

Coleophora pruniella, Clem. Imago unknown; the larva lives in a case which it attaches to the leaves.

Nepticula ? prunifoliella. Insect unknown. Dr. Clemens gave the name to an unknown larva, *possibly* Dipterous, which makes a crooked, linear mine on the upper surface of the leaves. Possibly it is identical with the next species.

Nepticula serotinæella, Cham. Larva makes a red, crooked, linear mine in the upper surface of the leaves.

Machimia tentoriferella, Clem. Imago unknown; the larva lives in a web on the under side of a leaf.

PRUNUS AMERICANA. Red Wild Plum.

Lithocolletis cratægella, Clem. Larva as in *Cerasus serotina* (*supra*).

Anarsia pruniella, Clem. Larva feeding in woody excrescences.

Evippe prunifoliella, Cham. Larva feeds under the tip of the leaf, turned down.

Xylesthia pruniramiella, Clem. Larva feeds in woody excrescences. There is also a larva of an unknown species which makes a linear mine, ending in a blotch, and which leaves the mine to pupate.

AMELANCHIER CANADENSIS. June- or Serviceberry.

Ornix quadripunctella, Clem. Larva in a tentiform mine in the leaves.

Nepticula amelanchierella, Clem. Larva makes a linear, crooked mine in the leaves; imago unknown.

CRATÆGUS, different species. Blackthorn, Hawthorn.

Lithocolletis cratægella, Clem. Larva and mine as in *Cerasus serotina* (*supra*).

Aspidisca splendoriferella, Clém. Larva and mine as in *Cerasus serotina* (*supra*).

Tischeria malifoliella, Clem. Larva in a flat, trumpet-shaped, yellowish mine in upper surface of leaves.

Ornix cratægifoliella, Clem. Larva in tentiform mine on under side of leaves.

Ornix inusitatumella, Cham. Larva in white flat mine, specked with "frass", in upper surface; pupates in the mine.

Nepticula cratægifoliella, Clem. Larva in a crooked, linear mine in upper surface of leaves; imago unknown.

PYRUS CORONARIA. Fragrant Crab.

Lithocolletis cratægella, Clem. Larva as in *Cerasus serotina* (*supra*).

Tischeria malifoliella, Clem. Larva as in *Cratægus* (*supra*).

Aspidisca splendoriferella, Clem. Larva as in *Cerasus serotina* (*supra*).

PYRUS MALUS. Apple.

Bucculatrix pomifoliella, Clem. Larva at first a miner, then feeds externally. As to other species, see *Pyrus coronaria* (*supra*).

PYRUS COMMUNIS. Common Pear.

Lithocolletis nidificansella, Packard. Said to mine the leaves; is most probably a *Lyonetia*.

CYDONIA VULGARIS. Common Quince.

CYDONIA JAPONICA. Japan or Flowering Quince.

Lithocolletis cratægella, Clem. Larva and mine as in *Cerasus serotina* (*supra*).

ROSA. Various species of Rose.

Coleophora rosæfoliella, Clem. Larva in a case feeds on leaves of *Rosa centifolia*.

Coleophora rosacella, Clem. Larva in a case feeds on leaves of Sweet-brier.

Tischeria rosaticola, Frey & Boll. Larva mines the leaves.

Nepticula rosæfoliella, Clem. Larva makes crooked, linear mines in leaves.

Gelechia rosæella, Cham. Imago unknown. Larva feeds in seed-capsules.

AGRIMONIA EUPATORIA.

Gelechia agrimoniella, Clem. The larva rolls the leaves and feeds on them.

RUBUS VILLOSUS. Blackberry.

Tischeria ænia, Frey & Boll. Larva makes a flat, somewhat trumpet-shaped, mine in upper surface of leaves.

Nepticula rubifoliella, Clem. Larva makes a linear crooked mine in the upper surface of the leaves.

RUBUS OCCIDENTALIS. Raspberry.
RUBUS CANADENSIS. Dewberry.

Tischeria ænia. See *Rubus villosus* (*supra*).

ONAGRACEÆ.

ŒNOTHERA (various species). Primrose.

Laverna œnotheræella, Cham. =?*Phyllocnistis magnatella*, Zell. Larva burrows in the stalk of *Œnothera missouriensis*.

Laverna œnotheræseminella, Cham. Larva feeds in the seeds.

Laverna circumscriptella, Zell. Larva feeds in the seeds.

Laverna murtfeldtella, Cham. Larva feeds on the flowers.

GROSSULACEÆ.

RIBES. Currant.

Gelechia ribesella, Cham. Larva folds and feeds on leaves of the Rocky Mountain Red Currant.

Gracilaria ribesella, Cham. Same food-plant, and feeds in the same way with *Gelechia ribesella*. Imago unknown.

SAXIFRAGACEÆ.

HYDRANGIA RADIATA. Wild Hydrangia.

Antispila hydrangiæella, Cham. Larva in small blotch mine; cuts out a case in which it descends to the ground to pupate.

HAMAMELACEÆ.

HAMAMELIS VIRGINICA. Witch Hazel.

Gracilaria superbifrontella, Clem. Larva at first a miner, afterward feeds externally, rolling the leaf into a cone.

Lithocolletis, sp.? Only the larva is known. It is possibly *L. aceriella* Clem., and makes a flat mine in the upper surface.

Catastega hamameliella, Clem. Imago unknown. The larva is at first a miner, and then makes a tube of "frass", in which it dwells.

LIQUIDAMBAR STYRACIFLUA. Sweet Gum.

Phyllocnistis liquidambarisella, Cham. Larva in a long, winding, linear mine in upper surface.

CORNACEÆ.

CORNUS FLORIDA. Dogwood.

Antispila cornifoliella, Clem. Larva in a blotch mine; afterward cuts out a case, in which it pupates on the ground.

NYSSA MULTIFLORA. Gum-tree.

Antispila nyssæfoliella, Clem. Larval habits as in *A. cornifoliella* (*supra*).

Nepticula nyssæella, Clem. Imago unknown. The larva makes a crooked, linear mine in the upper surface.

CAPRIFOLIACEÆ.

LONICERA SEMPERVIRENS. Honeysuckle.

Lithocolletis trifasciella?, Haw. Larva makes a tentiform mine in under side of leaves.

SYMPHORICARPA VULGARIS. Waxberry, or Indian Currant.

Lithocolletis trifasciella, Haw. (*Vid. Lonicera supra.*)

Lithocolletis symphoricarpæella, Cham. Larvæ in tentiform mines in under side of leaves.

VIBURNUM OPULUS. Snowball.

Coleophora viburnæella, Clem. Imago unknown. Larva in a case feeding on the leaves.

RUBIACEÆ.

CEPHALANTHUS OCCIDENTALIS. Button-bush.

Laverna cephalanthiella, Cham. The larva at first in a small, somewhat trumpet-shaped mine beginning at the midrib; afterward leaves it, and makes one or more larger ones nearer the edge of the leaf.

COMPOSITÆ.

Suborder TUBULIFLORÆ.

Tribe VERNONIACEÆ.

VERNONIA (various species). Iron-weed.

Coleophora vernoniæella, Cham. Imago unknown. Larva in a very long, slender case, feeding on the leaves.

Tribe EUPATORIACEÆ.

EUPATORIUM AGERATOIDES. Boneset.

Depressaria eupatoriiella, Cham. Larva feeds on under side of the leaves, which it wrinkles or slightly folds.

Gracilaria eupatoriiella, Cham. Larva makes a large tentiform mine in under surface of leaves, the cuticle becoming wrinkled and contracted over the mined space.

Nothris eupatoriiella, Cham. Larval habits similar to those of *Depressaria eupatoriiella* (*supra*).

Tribe ASTEROIDEÆ.

ASTER (various species). Starworts.

Gracilaria astericola, Frey & Boll. Larva mines and afterward rolls the leaves.

Butalis matutella, Clem. Larva in a web on under side of leaves, from which it mines out the parenchyma, feeding between the upper and lower cuticle. Imago with *B. flavifrontella* and *Coleophora corrusicipennella* Clem. on the flowers.

ERIGERON (various species?). Flea-bane.

Gracilaria erigeronella, Cham. Larva in a tentiform under-side mine; leaves the mine to pupate.

SOLIDAGO (various species?). Golden-rod.

Tischeria solidaginisella, Clem. Larva in a blotch mine in upper sides.

Gelechia gallæsolidaginis, Riley. Larva burrows in the stem, making a fusiform swelling.

Tribe SENECIONIDÆ.

AMBROSIA TRIFIDA. Horse- or Hog-weed.

Lithocolletis ambrosiæella, Cham. Larva in tentiform mine in under side of leaves.

Bucculatrix ambrosiæella, Cham. Larva, when very young, a miner; afterward feeds externally on the leaves.

Tischeria ambrosiæella, Cham. } Larva in blotch mines, with an opaque
Tischeria heliopsisella, Cham. } *nidus*, from which the imago emerges.
In one species, the *nidus* is on the upper, in the other on the lower surface of the leaf.

Butalis matutella, Clem. See under *Aster* (*supra*).

Gelechia ambrosiæella, Cham. Larva feeds in the seed.

AMBROSIA ARTEMISIFOLIA. Rag-weed.

Tischeria ambrosiæfoliella, Cham. Larva in a blotch mine at the margin of the leaf.

Cryptolechia, sp.? (undescribed). Possibly *C. quercicella*, Clem. Larva feeds on the leaves externally.

Gelechia dubitella, Cham. Larva folds a leaf so as to form a case, in which it feeds.

Gelechia chambersella, Murtfeldt. Larva feeds externally on the leaves.

HELIOPSIS (various species). Oxeye.

Tischeria heliopsisella, Cham. Larval habit as in *Ambrosia trifida* (*supra*).

HELIANTHUS (various species). Sunflowers.

Lithocolletis ambrosiæella, Cham. Larval habit as in *Ambrosia trifida* (*supra*).

Lithocolletis helianthivorella, Cham. Larval habits as in the last species (*ambrosiæella*); that is, it lives in a tentiform under-side mine.

Glyphipteryx montisella, Cham. Imago found on the flowers in August. Larva unknown.

ERECHTITES HIERACIFOLIUS. Fire-weed.

Phyllocnistis erechtitisella, Cham. Imago unknown. Larva in a long, narrow, linear, winding mine in upper surface of the leaves.

AQUIFOLIACEÆ.

ILEX OPACA. Holly.*

Cryptolechia cryptolechiella, Cham. Larva sews together the leaves. (Having only a leaf, I am not certain of the plant.)

EBENACEÆ.

DIOSPYROS VIRGINIANA. Persimmon.

Aspidisca diospyriella, Cham. Larva in a minute blotch mine, from which it cuts out a case in which it pupates.

PRIMULACEÆ.

LYSIMACHIA LANCEOLATA. Loose-strife.

Lithocolletis lysimachiæella, Cham. Imago unknown. Larva in a small tentiform mine in under surface of leaves.

LABIATÆ.

SCUTELLARIA (various species). Skullcap.

Gelechia scutellariæella, Cham. Larva in a case attached to the under side of the leaves, and from which it mines out the parenchyma between the cuticles.

CONVOLVULACEÆ.

IPOMEA and PHARBITES (various species). Morning Glory.

Bedellia somnulentella, Stainton. Larva makes a web on under side of the leaves, from which it eats out the parenchyma between the cuticles. (Similar to the habit of *Butalis matutella* on leaves of *Ambrosia trifida* and Asters.)

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* In Washington, D. C., in January, I have found empty mines of two species of *Tineina*, both of which are undescribed. They were found in leaves of different species of Holly. One mine is probably that of a *Lithocolletis* larva, of the flat group, in leaves of *I. opaca*. The other is probably that of a *Nepticula*, and was in leaves of another species.

SOLANACEÆ.

SOLANUM CAROLINENSE. Horse Nettle.

Gelechia solaniiella, Cham. Larva in a small blotch mine.

PHYSALIS VISCOSA. Ground Cherry.

Gelechia physaliella, Cham. Larva in a tentiform mine in the under surface.

Gelechia physalivorella, Cham. Larva feeds on the leaves in a way not yet discovered. A larva, probably of a *Laverna*, burrows in the stem in Colorado, causing a fusiform swelling.

NYCTAGINACEÆ.

ABRONIA FRAGRANS.

Lithariapteryx abroniæella, Cham. Larva mines the leaves, frequently leaving one mine to make another. Imago common about the plant in July and August in Colorado.

CHENOPODIACEÆ.

CHENOPODIUM and ATRIPLEX. Goosefoot.

Gelechia hermanella, Fab. Larva mines the leaves, making an irregular, somewhat serpentine, track, with scattered "frass".

LAURACEÆ.

SASSAFRAS OFFICINALE. Sassafras.

Gracilaria sassafrasella, Cham. Larva, when very young, mines the leaves; older, it rolls them downward.

ULMACEÆ.

ULMUS AMERICANA. Elm.

Lithocolletis argentinotella, Clem. Larva makes a tentiform mine in the under side of the leaves; *rarely* in the upper side.

Lithocolletis ulmella, Cham. Larva makes a flat mine in the upper side of the leaves.

(*Argyresthia austerella* Zeller, I am convinced, feeds in some way on it; and in latter May and in June the imago may be found about the trees.)

CELTIS OCCIDENTALIS. Hackberry.

Lithocolletis celtisella, Cham. Larva in a blotch mine showing about as plainly on one surface as on the other. *Very* abundant.

Lithocolletis celtifoliella, Cham. Larva in a tentiform mine in the under surface. *Very* rare.

PLATANACEÆ.

PLATANUS OCCIDENTALIS. Sycamore, Buttonwood, Plane-tree.

Nepticula platea, Clem.
Nepticula maximella, Cham.
Nepticula clemensella, Cham.

Larva of these three species in the upper surfaces of leaves. For description of the mines and species see Can. Ent. v. 125.

Cirrha platanella, Cham. Larva feeds on the under side of the leaves, and pupates in a tube composed of silk and the down from the leaves. There is also an unknown larva, which makes a large mine, exactly like that made by *Coriscium albanotella* Cham. in Oak leaves.

JUGLANDACEÆ.

JUGLANS NIGRA. Black Walnut.

Lithocolletis caryæfoliella, Clem. Larva in irregular blotch mine in upper surface of leaves. (*L. juglandiella* Clem. is the same species.)

Gracilaria blandella, Clem. Larva when small in a linear whitish mine in upper surface of leaves; afterward feeding and pupating under the edge of the leaf turned down.

Gracilaria juglandisnigræella, Cham. Larva at first mining the leaves beneath; afterward feeding and pupating under the edge turned up.

Aspidisca juglandiella, Cham. Larva in a very small blotch mine, from which it cuts out a case in which it pupates.

Nepticula juglandifoliella, Cham. (& Clem.?). Larva in small, linear, crooked mines; many on a leaf sometimes. Mine in upper surface.

JUGLANS CINEREA. Butternut.

Lithocolletis caryæfoliella, Clem. As in *Juglans nigra* (*supra*).

CARYA ALBA. Hickory.

Lithocolletis caryæfoliella, Clem. See under *Juglans nigra* (*supra*).

Lithocolletis caryæalbella, Cham. Larva in a tentiform mine in the under surface of the leaves.

Aspidisca lucifluella, Clem. Larva in a small blotch mine, from which it cuts out its pupal case.

Coleophora caryæfoliella, Cham. (& Clem.?). Larva feeds in a cylindrical case attached to the under surface of the leaves.

Nepticula caryæfoliella, Clem. Imago unknown. Larva in a linear crooked mine on the upper side of the leaves.

Ypsolophus caryæfoliella, Cham. Larva sews together the leaves.

Gracilaria, sp.? (probably *G. blandella* Clem.). Imago unknown. The larva when young makes a linear whitish mine in the upper surface of the leaves.

CUPULIFERÆ.

QUERCUS. Oak (various species).

(Different species of Oak are so frequently fed on by the same larvæ, that I have not attempted to arrange them according to the botanical species, since that would cause too frequent repetition of the account of each larva. I have therefore arranged them simply as miners of the upper and lower surfaces of the leaves, with an occasional note as to the species of Oak fed upon by the larva. The species which feed externally are arranged separately, following the leaf-mining species.)

Leaf-miners of the upper surface.

Lithocolletis cincinnatiella, Cham. Yellowish blotch mine.

Lithocolletis hamadryadella, Clem. Whitish blotch mine.

Lithocolletis tubiferella, Clem. } Mines somewhat like the track
Lithocolletis bifasciella, Cham. } made by a drop of water as to form.

Lithocolletis bicolorella, Cham. Yellowish blotch mine, like that of *L. ulmella* in Elm.

Lithocolletis unifasciella, Cham. } Irregular yellowish blotch mines,
Lithocolletis bethuneella, Cham. } smaller than that of *cincinnatiella*,
Lithocolletis castaneæella, Cham. } and usually in Red or Black Oaks.

Tischeria zelleriella, Clem.
Tischeria pruinoseella, Cham.
Tischeria castaneæella, Cham.
Tischeria badiiella, Cham.
Tischeria quercivorella, Cham.
Tischeria quercitella, Clem.
Tischeria citrinipennella, Clem.
Tischeria complanoides, Frey & Boll. (Doubtful species.)
Tischeria concolor, Zeller. (Food-plant uncertain.)
Tischeria tinctoriella, Cham.

Nepticula platea, Clem. } Imago unknown. Larvæ of both in
Nepticula anguinella, Clem. } crooked, linear mines.

Nepticula quercipulchella, Cham. }
Nepticula quercicastanella, Cham. } Larvæ in crooked, linear mines.
Nepticula saginella, Clem. }

Coriscium. Imago unknown. The larva, in Colorado, makes a large tentiform mine in the *upper* side of the leaves, which is almost a facsimile of that made in the Ohio Valley by the larva of *Coriscium albanotella*, Cham. in the *under* surface of the leaves.

Coleophora querciella, Clem. Imago unknown. The larva lives in a case which it attaches to the leaves.

Catastega timidella, Clem. Imago unknown. Larva at first mines the leaves, and afterward lives in a tube made of "frass". (?Not a *Tineina*.)

Leaf-miners of the under surface.

Lithocolletis quercitorum, Frey & Boll.
Lithocolletis fitchella, Clem.
Lithocolletis basistrigella, Clem.
Lithocolletis æriferella, Clem.
Lithocolletis quercipulchella, Cham.
Lithocolletis quercialbella, Cham. Tentiform mines.
Lithocolletis fuscocostella, Cham.
Lithocolletis albanotella, Cham.
Lithocolletis obstrictella, Clem.
Lithocolletis hageni, Frey & Boll.
Lithocolletis argentifimbriella, Clem.
Lithocolletis intermedia, Frey & Boll. Doubtful species.
Lithocolletis mirifica, Frey & Boll. Doubtful species.
Ornix quercifoliella, Cham. Under edge of leaf turned down.
Coriscium albanotella, Cham. Large tentiform mine.

The following species either roll, fold, or sew the leaves together:—
Ypsolophus querciella, Cham.
Gelechia querciella, Cham.
Gelechia quercinigræella, Cham.
Gelechia quercivorella, Cham.
Gelechia quercifoliella, Cham.
Cryptolechia quercicella, Clem.
Machimia tentoriferella, Clem. Larva in a web.

The following species feed in galls:—
Ypsolophus quercipomonella, Cham.
Gelechia gallægenitella, Clem.
Hamadryas bassettella, Clem.
Blastobasis glandulella (*Holcocera glandulella* Riley) feeds in acorns.

CASTANEA AMERICANA. Chestnut.

Lithocolletis castaneæella, Cham. Larva in a blotch upper-surface mine in the leaves.

Lithocolletis, sp.? Imago unknown. Larva in tentiform mine in under surface of leaves.

Bucculatrix trifasciella, Clem. The larva *probably* feeds on it.

Tischeria castaneæella, Cham. Larva mines the upper surface of the leaves.

Nepticula castanæfoliella, Cham. Larva in crooked, linear mines in the upper surface.

FAGUS SYLVATICA. Beech.

Cryptolechia faginella, Cham. The larva sews together the leaves in August and later.

CORYLUS AMERICANA. Hazel.

Lithocolletis coryliella, Cham. Larva in a nearly circular blotch mine in the upper surface.

Nepticula corylifoliella, Clem. Imago unknown. Larva in a linear, crooked mine in the upper surface.

Gelechia coryliella, Cham. Imago unknown. Larva in the male catkins in autumn.

Hyale coryliella, Cham. Larva in a web on under surface of the leaves.

OSTRYA VIRGINICA. Iron Wood or Hornbeam.

Lithocolletis obscuricostella, Clem.
Lithocolletis ostryæfoliella, Clem.
} Larva in tentiform mines in under side of leaves.

Lithocolletis coryliella, Cham. See under *Corylus* (*supra*).

Lithocolletis tritæniaella, Cham. Larva in roundish blotch mine in upper surface of the leaves.

Ææa ostryæella, Cham. Larva in a flat mine between two ribs, with a row of "frass" on each side.

Aspidisca ostryæfoliella, Clem. Imago unknown. Larva in a minute blotch mine in upper surface of leaves, from which it cuts out its pupal case.

Nepticula ostryæfoliella, Clem.
Nepticula virginiella, Clem.
} Imago unknown. Larvæ make linear, crooked mines in upper surface of leaves.

Gracilaria ostryæella, Cham. Imago unknown. The larva when very small makes a linear, whitish mine in the upper surface of the leaves.

Coleophora ostryæ, Clem. Imago unknown. The larvà lives in a case and feeds on the under surface of the leaves.

CARPINUS AMERICANA. Waterbeech, Hornbeam.

Lithocolletis coryliella, Cham. See under *Corylus*.

BETULACEÆ.

ALNUS. Alders.

Lithocolletis alnivorella, Cham.
Lithocolletis alnifoliella, Hübner.
Lithocolletis auronitens, Frey & Boll.
} Larvæ in tentiform mines in the under side of the leaves.

Gracilaria alnicolella, Cham.
Gracilaria alnivorella, Cham.
} When very young, the larvæ mine the leaves; when older, they roll them downward, *alnicolella* from the tip, *alnivorella* from the side.

Lyonetia alniella, Cham. The larva makes a large brownish blotch mine in the leaves.

SALICACEÆ.

SALIX (various species). Willows.

Lithocolletis salicifoliella, Cham. (& Clem.?). Larva in a tentiform mine in the under surface of leaves.

Gracilaria salicifoliella, Cham. Larva in a blotch mine in upper surface of the leaves.

Gracilaria purpuriella, Cham. Larva rolls the leaves from the tip so as to form a cone.

Cemiostoma albella, Cham. Larvæ in large blackish blotch mines.

Aspidisca saliciella, Clem. & Cham. Larva in a minute blotch mine, from which it cuts out its pupal case.

Nepticula fuscotibiaeella, Clem. Larva in a linear mine bent back on itself.

Nepticula. Two unknown species make narrow, linear, crocked mines, one of which is in the upper and the other in the lower surface of the leaves.

Marmara salictella, Clem. Larva burrows in young twigs.

Batrachedra præangusta, Haw.
Batrachedra salicipomonella, Clem.
Batrachedra striolata, Zeller.

The specific distinctness of the insects described under these names seems to me not sufficiently established. *B. salicipomonella* was bred from galls made by other insects on Willows. The mode of feeding of the others is not satisfactorily determined.

Gelechia salicifungella, Clem.
Gelechia fungivorella, Clem.

Larvæ in galls made by *Cynips*.

Gelechia, sp.? Imago unknown. The larva sews together Willow leaves at great elevations in the Rocky Mountains.

POPULUS (various species). Poplars, Aspens, Cottonwood.

Cemiostoma albella, Cham. See under *Salix*.

Batrachedra præangusta, Haw.
Batrachedra salicipomonella, Clem.
Batrachedra striolata, Zeller.

See under *Salix*.

Aspidisca sp.? Makes a minute mine in Aspen leaves in Oregon. Possibly it is *A. splendoriferella* Clem.

Gracilaria populiella, Cham. Larva rolls Aspen leaves in the Rocky Mountains.

G. purpuriella, Cham. Larva mines leaves of Silver-leaf Poplar. See under *Salix*.

Lithocolletis populiella, Cham. Larva in a tentiform mine in under side of leaves of Silver-leaf Poplar.

A larva of an unknown *Nepticula* (?) mines leaves of Cottonwoods in Colorado.

A larva, possibly not Lepidopterous, mines Cottonwood leaves at the tip in the upper surface in Colorado.

LILIACEÆ.

YUCCA (various species?). Soapweed, Spanish Bayonet, Bear's Grass.

Pronuba yuccasella, Riley. Larva feeds in the ovary on the seed. Imago found in the flowers.

SMILACEÆ.

SMILAX GLAUCA. Greenbrier, Sarsaparilla.

Phyllocnistis smilacisella. Imago unknown. The larva makes a linear white mine in the upper surface of the leaves.

GRAMINEÆ.

BRACHELYTRUM ANGUSTATUM.

Elachista brachelytrifoliella, Clem. Larva mines in the leaf-blades.

POA PRATENSE. Blue Grass.

Elachista præmaturella, Clem. Larva *probably* mines the blades of this grass.

PANICUM CLANDESTINUM. Panic Grass.

Cycloplasis panicifoliella, Clem. The larva mines the leaf-blades.

TRITICUM VULGARE. Wheat.

Gelechia cerealella, Auct. The larva feeds on the grain.

ART. V.—INDEX TO THE DESCRIBED TINEINA OF THE UNITED STATES AND CANADA.

BY V. T. CHAMBERS.

Having, in the last ten years, described a large number of new species of the *Tineina*, with notes on many other species previously known in various scientific periodicals, and the notes and descriptions referred to being, therefore, scattered through various volumes, I have been urged by other entomologists to catalogue the species. Many other species had been previously described by other authors, whose publications were equally scattered and inaccessible with my own, so that, for my own convenience in the study of the group, I had prepared an index for ready reference to the species, and that index needed but little alteration to make it complete, so far as I am acquainted with the species.

Convinced that a catalogue of my own species only would be of but little service to students, while the writings of others were so inaccessible, and, indeed, unknown to many American entomologists, it has seemed to me that a publication of this index would answer the purpose better than a mere catalogue of the species. I therefore offer it in the hope that it may prove as useful to brother entomologists as it has been to me.

It is only an index of the species *as American species*. Many of our species are identical with those of Europe, and I have not attempted to abstract the entomological literature of Europe as to these species.

As to the European literature of the subject (American *Tineina*), I have not attempted to bring it down to a later period than the latter part of the year 1875. For, having been absent in Colorado during the greater part of the time, it was impossible to keep *au courant* with it; and if any European publications have been made since that time they are unknown to me. A letter from a gentleman in Europe, received by me in 1875, informed me that Professor Frey was then engaged upon a work on American *Tineina*, but if it has been published I have not learned the fact. So far as American publications are concerned, the index is brought down to November, 1877, with references, also, to volume 10 of the Canadian Entomologist (1878), which will contain notes already prepared upon some species. There are also references to species described upon previous pages of this volume. These references are simply to the volume, not to the page.

Professors Zeller and Frey have described many of our species in various European publications. Usually (always?), however, these papers have been issued in a separate form, with different paging from that of the volumes in which they were originally published. In such cases, these separate publications will be more accessible to American students than the original publications, and I have, therefore, in the index used the paging as given in the separate papers instead of that of the volumes.

For the convenience of any who may not have Mr. Stainton's valuable republication of Dr. Clemens's papers, I have also given references to the Proceedings of the Academy of Natural Sciences, Philadelphia, and those of the Entomological Society of Philadelphia, in which his papers were originally published.

It has unfortunately so happened that Professors Zeller and Frey and I have been engaged in the study of the group at the same time, and each to a great extent in ignorance of what the other was doing, and the necessary result has been a confusion of the synonymy of some of the species. This I have corrected so far as I have been able from the descriptions and figures given by them; but doubtless a comparison of specimens would reveal other cases in which the same species has been more than once described under different names.

The genus *Gelechia* is in a chaotic condition. It includes almost anything of a certain general type of structure. Many attempts have been made to subdivide it, but, to my mind, they are all unsatisfactory. I have also, myself, sometimes attempted to define new subgroups in the genus, but my own efforts in this direction are not more satisfactory than those of others; and while I have given them in their proper place in the alphabetical arrangement, in *italics*, I have included all, or by far the greater part of them, under *Gelechia*. I have pursued, also, the same course with the genus *Laverna*, which, though not inconveniently large, is not much better limited than *Gelechia*.

By some mischance or other, I have seldom been able to look over the proof-sheets of papers heretofore published by me on the *Tineina*, scarcely a dozen proof-sheets having been examined by me. Owing to this fact, and to careless writing also, no doubt the names of species described or referred to by me are frequently incorrect, the same name sometimes appearing under two or three different forms.

In the following index I have attempted to correct these errors so far as it may be done, and the names herein given are those that were intended originally in such cases.

The imperfections of this work are many, no doubt, and are perhaps more evident to me than to any one else. Nevertheless, I hope it will answer sufficiently well for a present index, and for the basis of a more perfect catalogue hereafter.

Many of the generic names originally given by the authors, such as *Aspidisca*, *Blepharocera*, *Phætusa*, *Wilsonia*, and others, are preoccupied, and will have to be changed. I have not, however, made any of these changes in this work, which purports to be nothing more than an "index" to what has already been published.

REFERENCES AND ABBREVIATIONS.[*]

Ag. Rep.—Agricultural Reports of United States Agricultural Department.
Am. Nat.—American Naturalist.
An. Ly. Nat. Hist.—Annals of the Lyceum of Natural History of New York.
Bei. z. Kennt.—Beiträge zur Kenntniss der Nordamerikanischen Nachtfalter.
Bul. Buff. Soc.—Bulletin of the Buffalo Society of Natural History.
Can. Ent.—Canadian Entomologist.
Cin. Quar. Jour. Sci.—Cincinnati Quarterly Journal of Science.
Ent. Mo. Mag.—Entomologists' Monthly Magazine.
Ent. Week. Int.—Entomologists' Weekly Intelligencer.
Guide.—Guide to the Study of Insects (Packard).
Hayd. Bul. Geo. Sur.—Bulletin of the United States Geological and Geographical Survey.
Lep. West. Amer.—Lepidoptera der Westküste Amerikas (Zeller).
Lin. Ent.—Zeller in "Linea Entomologica."
Nat. Hist. Tin.—Natural History of the Tineina by Stainton, Zeller and Frey.
Ont. Rep.—Report of the Entomological Society of Ontario (Canada).
Proc. Acad. Nat. Sci. Phila.—Proceedings of the Academy of Natural Science (Philadelphia), 2d series.
Proc. Ent. Soc. Phila.—Proceedings of the Entomological Society of Philadelphia.
Rep. Mass. Ag. Soc.—Report on the Injurious and Beneficial Insects of Massachusetts. State Board of Agriculture. Reports 1-3. 1871-1873.—Packard.
Rep. Nox. Ins. Mo.—Riley's "Reports on the Noxious, Beneficial, and Other Insects of Missouri".
Rep. Nox. Ins. N. Y.—Dr. Fitch's "Reports on the Noxious, Beneficial, and Other Insects of New York".
Sch. v. Eu.—Schmetterlinge von Europa.
S. E. Z.—Frey and Boll, in Stettiner Entomologische Zeitung, 1873.
Tin. Nor. Amer.—"Tineina of North America." (Stainton's republication of the Clemens papers.)
Treat. Ins.—Harris's Treatise on Insects Injurious to Vegetation.

ACANTHOCNEMES. (Chambers.)

A. FUSCOSCAPULELLA, Cham.—*Ante*, 104.

ADELA. (Latreille.)

A. BELLA, Cham.—Can. Ent. v. 73; ix. 207.
A. BIVIELLA, Zell.—Bei. z. Kennt. May, 1873, 26.—Can. Ent. ix. 206.
A. CHALYBEIS, Zell.—Bei. z. Kennt. May, 1873, 25.
A. (DICTE) CORRUSCIFASCIELLA, Cham.—Can. Ent. v. 74; ix. 207.
(*Dicte corruscifasciella*, Cham. *loc. cit.*)
(*Adela schlægeri*, Zell.—Bei. z. Kennt. May, 1873, 27.)
(*A. fasciella*, Cham. = *A. trigrapha*, Zell. *post.*)
A. FLAMENSELLA, Cham.—Can. Ent. viii. 104.
A. RIDINGSELLA, Clem.—Proc. Ent. Soc. Phila. 1864, ii. 426.—Tin. Nor. Amer. 250.—Guide, 348.

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[*] Morris's "Synopsis"; contains brief descriptions of a few species but as they are copied or condensed from the original descriptions, which are referred to in this "Index", I have not deemed it necessary to refer further to them herein. The "Synopsis" is contained in the Smithsonian Miscellaneous Collections, v. 4, and has also been separately published.

(*A. schlægeri*, Zell. = *A. corruscifasciella*, Cham. *supra.*)
A. TRIFASCIELLA, Cham.—Can. Ent. viii. 103.
A. TRIGRAPHA, Zell.—Bei. z. Kennt. May, 1875, 136.
(*A. fasciella*, Cham.—Can Ent. viii. 103.)

(ADRASTEIA. Chambers.)

(*A. quercifoliella*, Cham. = *Gelechia quercifoliella*, Cham.)
(*A. querciella*, Cham. = *Gelechia querciella*, Cham.)
(*A. alexandriæella*, Cham. = *Gelechia alexandriæella*, Cham.)
(*A. fasciella*, Cham. = *Gelechia fasciella* Cham.)

ÆÆA. (Chambers.)

Æ. OSTRYÆELLA, Cham.—Can. Ent. vi. 74; viii. 172; x. p. —.
Æ. PURPURIELLA, Cham.—Can. Ent. vi. 73; x. p. —.
(*Chrysopeleia purpuriella*, Cham. *ibid.*)

(ÆSYLE. Chambers.)

(*Æ. fasciella*, Cham. = *Gracilaria fasciella*, Cham. *post.*)

AELOLE. (Chambers.)

A. BELLA, Cham.—Can. Ent. vii. 73.—Hayd. Bul. Geo. Sur. iii. 144.—Can. Ent. ix. 72.

AGNIPPE. (Chambers.)

A. BISCOLORELLA, Cham.—Can. Ent. iv. 195; v. 230; ix. 231.
(*A. fuscopulvella*, Cham. *ibid.* = *biscolorella*, var.)

(ALEUCITA. Auct.)

(*A. cerealella*, Oliv. = *Gelechia cerealella*, *post.*)

AMADRYA. (Clemens.)

A. EFFRENATELLA, Clem.—Tin. Nor. Amer. 39, 55, 59, 60, 86.—Proc. Acad. Nat. Sci. Phila. 1859, 260.—Cin. Quar. Jour. Sci. ii. 256.—Bei. z. Kennt. May, 1873, 19.
A. CLEMENSELLA, Cham.—Can. Ent. vi. 232.—Cin. Quar. Jour. Sci. ii. 256.

(ANACAMPSIS. Curtis.)

(*A. agrimoniella* = *Gelechia agrimoniella*, *post.*)
(*A. cerealella* = *Gelechia cerealella*, *post.*)
(*A. glandiferella*? = *G. glandiferella*, *post.*)
(*A. robiniella* = ? *G. robiniella*, *post.*)
(*A. sarcitella* = ? *G. sarcitella*, *post.*)

ANAPHORA. (Clemens.)

A. ARCANELLA, Clem.—Tin. Nor. Amer. 57, 58.—Proc. Acad. Nat. Sci. 1859, 262.—Can. Ent. iv. 143.—*Ante*, 79.

A. **AGROTIPENNELLA**, Grote.—Can. Ent. iv. 137; viii. 185.—*Ante*, 79.

A. **BOMBYCINA**, Zell.—Bei. z. Kennt. May, 1873, 16.—*Ante*, 79.

A. **MORTIPENNELLA**, Grote.—Can. Ent. iv. 137.

A. **PLUMIFRONTELLA**, Clem.—Tin. Nor. Amer. 39, 57, 59, 60.—Proc. Acad. Nat. Sci. Phila. 1859, 261.—Bei. z. Kennt. 1873, 17.

A. **POPEANELLA**, Clem.—Tin. Nor. Amer. 57.—Proc. Acad. Nat. Sci. Phila. 1859, 261.—Can. Ent. iv. 137, 143.—Bei. z. Kennt. 1873, 15. = *? scardina*, Zell.

A. **SCARDINA**, Zell. = *? popeanella*, Clem.—Bei. z. Kennt. May, 1873, 16.

A. **TEXANELLA**, Cham.—*Ante*, 79.

ANARSIA. (Zeller.)

A. **LINEATELLA**, Zell.—Tin. Nor. Amer. 36, 128.—Proc. Acad. Nat. Sci. Phila. 1860, 169.—Can. Ent. iv. 208; vi. 243.—Ag. Rep. 1872, 112.

(*A. pruniella*, Clem. = *A. lineatella*, *supra*.—Tin. Nor. Amer. and Acad. Nat. Sci. Phila. *loc. cit.*)

A. **SUFFUSELLA**, Cham.—Can. Ent. vi. 243.

A. **TRIMACULELLA**, Cham.—Can. Ent. vi. 243.—*Ante*, 92.

ANESYCHIA. (Hübner.)

A. **DISCOSTRIGELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. pt. 1, 122, 144.

A. **HAGENELLA**, Cham.—*Ante*, 80.

A. **MIRUSELLA**, Cham.—Can. Ent. vi. 233.—Hayd. Bul. Geo. Sur. iii. pt. 1, 121, 141.

(*A multipunctella*, Cham. Can. Ent. vi. 233, = *Psecadia semilugens*, Zell. *post.*)

A. **SPARCICELLA**, Clem.—Tin. Nor. Amer. 255.—Proc. Ent. Soc. Phila. ii. 430.

A. **TRIFURCELLA**, Cham.—Can. Ent. v. 12.—*Ante*, 80.

ANORTHOSIA. (Clemens.)

A. **PUNCTIPENNELLA**, Clem.—Tin. Nor. Amer. 40, 111.—Proc. Acad. Nat. Sci. Phila. 1860, 161.—Can. Ent. vi. 245.

ANTISPILA. (Her.-Sch.)

A. **AMPELOPSIELLA**, Cham.—Can. Ent. vi. 168, 197; ix. 195.

A. **CORNIFOLIELLA**, Clem.—Tin. Nor. Amer. 103.—Proc. Acad. Nat. Sci. Phila. 1860, 11.—Can. Ent. vi. 166, 170, 198.

A. **HYDRANGIÆELLA**, Cham.—Can. Ent. vi. 170; ix. 195.

A. **ISSABELLA**, Clem.—Tin. Nor. Amer. 142.—Proc. Acad. Nat. Sci. Phila. 1860, 209.—Can. Ent. vi. 167, 198.

A. **NYSSÆFOLIELLA**, Clem.—Tin. Nor. Amer. 19, 22, 102.—Proc. Acad. Nat. Sci. Phila. 1860, 11.

A. **VITICORDIFOLIELLA**, Cham.—Tin. Nor. Amer. 142.—Proc. Acad. Nat. Sci. Phila. 1860, 209.—Can. Ent. vi. 168, 198.

ARGIOPE. (Chambers.)

A. DORSIMACULELLA, Cham.—Can. Ent. v. 13, 174.
(*Heribeia dorsimaculella*, Cham.—Can. Ent. iv. 43.)

ARGYRESTHIA. (Hübner.)

A. ABDOMINALIS, Zell.—Bei. z. Kennt. May, 1870, 106.
A. ALTISSIMELLA, Cham.—Hayd. Bul. Geo. Sur. iii. pt. 1, 130, 147.
A. ANDEREGIELLA, F. v. R.—Proc. Acad. Nat. Sci. Phila. 1860, 7.—Tin. Nor. Amer. 39, 93.—Can. Ent. vi. 10; vii. 145.—Bei. z. Kennt. May, 1873, 104.—? Hayd. Bul. Geo. Sur. iii. 131, 141.
(*A. oreasella*, Clem.—Tin. Nor. Amer. and Proc. Acad. Nat. Sci. *loc. cit. supra.*)
A. APICIMACULELLA, Cham.—Can. Ent. vi. 11 (and erroneously by a MS. name at vi. 145, as *visaliella*).
A. AUSTERELLA, Zell.—Bei. z. Kennt. May, 1873, 105.
(*A. undulatella*, Cham.—Can. Ent. vi. 10; vii. 145; ix. 72.)
A. BELANGERELLA, Cham.—Can. Ent. vii. 145.
A. DELETELLA, Zell.—Bei. z. Kennt. May, 1875, 105.
A. GŒDARTELLA ?, Lin.—Can. Ent. vii. 144; viii. 19.—Ent. Mo. Mag. ii. 279.—Cin. Quar. Jour. Sci. ii. 294.—Hayd. Bul. Geo. Sur. iii. 131, 141, 147.
A. MONTELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 130.
A. QUADRISTRIGELLA, Zell.—Bei. z. Kennt. 1873, 104.
A. QUERCICOLELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 130.
(*A. oreasella*, Clem. = *A. anderegiella*, *ante.*)
A. PEDMONTELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 131.
(*A. undulatella*, Cham. = *A. austerella*, Zell. *ante.*)

(ARGYROMIGES. Curtis.)

(*A. morrisella*, Fitch, = *Lithocolletis robiniella*, Clem. *post.*)
(*A. ostensackenella*, Fitch, = *Lithocolletis ostensackenella*, Fitch, *post.*)
(*A. pseudacaciella*, Fitch, = *Lithocolletis robiniella*, Fitch, *post.*)
(*A. quercialbella*, Fitch, = *Lithocolletis quercialbella*, Fitch, *post.*)
(*A. quercifoliella*, Fitch, = *Lithocolletis fitchella*, Clem. *post.*)
(*A. uhlerella*, Fitch, = *Lithocolletis uhlerella*, Fitch, *post.*)

ASPIDISCA. (Clemens.)

A. DIOSPYRIELLA, Cham. = ? *splendoriferella*, Clem.—Can. Ent. vi. 217.
A. ELLA, Cham. = ? *A. lucifluella*, Clem.—Can. Ent. iii. 224; vi. 152, 218.
A. JUGLANDIELLA, Cham. (? = *splendoriferella*, Clem. or ? = *lucifluella*, Clem.).—Can. Ent. vi. 151, 218 *et seq.*
A. LUCIFLUELLA, Clem.—Tin. Nor. Amer. 143; Proc. Acad. Nat. Sci. Phila. 1860, 209.—Can. Ent. iii. 224; vi. 218.
A. OSTRYÆFOLIELLA, Clem.—Tin. Nor. Amer. 171.—Proc. Ent. Soc. Phila. 1861, 82.

(*A. pruniella*, Clem. = *A. splendoriferella*, Clem.)
A. SALICIELLA, Cham. (and Clem.?).—Tin. Nor. Amer. 171.—Proc. Ent. Soc. Phila. 1861, 82.—Can. Ent. vi. 169.
A. SPLENDORIFERELLA, Clem.—Tin. Nor. Amer. 23, 26, 105.—Proc. Acad. Nat. Sci. Phila. 1860, 12.—Can. Ent. iii. 223; v. 50; vi. 149, 219.—Ent. Mo. Mag. ix. 17.
(*A. pruniella*, Clem.—Tin. Nor. Amer. 171.—Proc. Ent. Soc. Phila. 1861, 82.)
(*Lyonetia saccatella*, Pack. Guide, 355.—Can. Ent. iii. 223.)

(ASYCHNA? Stainton.)

(*A.? pulvella*, Cham.—Can. Ent. viii. 171; ix. 145.)

BATRACHEDRA. (Stainton.)

B. CLEMENSELLA, Cham. (doubtful species).—Hayd. Bul. Geo. Sur. iii 134.—Can. Ent. ix. 146.
B. PRÆANGUSTA, Haw.—Ins. Brit. iii. 230, and authorities there cited.—Hayd. Bul. Geo. Sur. iii. 134, 141.—Can. Ent. ix. 145.
B. SALICIPOMONELLA, Clem.—Tin. Nor. Amer. 265.—Proc. Ent. Soc. Phila. v. 142; vi. 273.—Bei. z. Kennt. 113.—Can. Ent. ix. 146.—Hayd. Bul. Geo. Sur. iii. 134.—Guide, 352.
B. STRIOLATA, Zell.—Bei. z. Kennt. 1873, 113.—Can. Ent. ix. 145.

BEDELLIA. (Stainton.)

B. SOMNULENTELLA, Zell.—Tin. Nor. Amer. 39, 189.—Proc. Ent. Soc. Phila. 1862, 147.—Cin. Quar. Jour. Sci. ii. 297.—Hayd. Bul. Geo. Sur. iii. 133, 141.
(*B. staintonella*, Clem.—Tin. Nor. Amer. 95.—Proc. Acad. Nat. Sci. Phila. 1860, 8.—Proc. Ent. Soc. Phila. 1862, 147.)

(BEGOE. Chambers.)

(*B. costoluteella*, Cham. = *Nothris eupatoriiella*, Cham. *post.*)

BLASTOBASIS. (Zeller.)

B.? AUFUGELLA, Zell.—Bei. z. Kennt. 100.
B. CHALCOFRONTELLA, Clem.
(*Holcocera chalcofrontella*, Clem.)—Tin. Nor. Amer. 226.—Proc. Ent. Soc. Phila. ii. 122.—Can. Ent. iv. 65; vi. 246.—Cin. Quar. Jour. Sci. ii. 256.—Bei. z. Kennt. May, 1873, 95.
B. CLEMENSELLA, Cham.
(*Holcocera clemensella*, Cham.)—Can. Ent. vi. 246.
B. FRACTILINEELLA, Zell.—Bei. z. Kennt. 1873, 98.
B. FLUXELLA, Zell.—Bei. z. Kennt. 1873, 101.
B. GIGANTELLA, Cham.—Can. Ent. viii. 219.—Hayd. Bul. Geo. Sur. iii. 149.

B. GILBOCILIELLA, Clem.
(*Holcocera gilbociliella*, Clem.)—Tin. Nor. Amer. 227.—Proc. Ent. Soc. Phila. ii. 122.—Bei. z. Kennt. 1873, 95.

B. GLANDULELLA, Riley.
(*Gelechia glandulella*, Riley.)—Can. Ent. iii. 13.
(*Holcocera glandulella*, Riley.)—Can. Ent. iv. 18, 38, 62, 65.—Rep. Nox. Ins. Mo. n. 4, 144.—Cin. Quar. Jour. Sci. ii. 256.

B. LIVOLELLA, Zell.—Bei. z. Kennt. May, 1873, 99.

B. MODESTELLA, Clem.
(*Holcocera modestella*, Clem.)—Tin. Nor. Amer. 227.—Proc. Ent. Soc. Phila. ii. 122.

B. NUBILELLA, Zell.—Bei. z. Kennt. 1873, 97; 1875, 139.

B. FUSCOPULVELLA, Clem.
(*Holcocera fuscopulvella*, Clem.)—Tin. Nor. Amer. 227.—Proc. Ent. Soc. Phila. ii. 122.

B. PURPUROCOMELLA, Clem.
(*Holcocera purpurocomella*, Clem.)—Tin. Nor. Amer. 227.—Proc. Ent. Soc. Phila. ii. 123.

B. QUISQUILIELLA, Zell.—Bei. z. Kennt. 1873, 97.

B. RETECTELLA, Zell.—Bei. z. Kennt. 1873, 97.

B. SCIAPHIELLA, Zell.—Bei. z. Kennt. 1873, 95.—Can. Ent. ix. 71.

B. SEGNELLA, Zell.—Bei. z. Kennt. 1873, 96.

B. TRIANGULARISELLA, Cham.—Cin. Quar. Jour. Sci. ii. 256.—Can. Ent. ix. 71.

(BLABOPHANES.)

(*B. rusticella* and *B. dorsistrigella*, Clem. *vid. Tinea.*)

BLEPHAROCERA. (Chambers.)

B. HAYDENELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 145.

BRACHYLOMA. (Clemens.)

B. UNIPUNCTA, Clem.—Tin. Nor. Amer. 232.—Proc. Ent. Soc. Phila. 1863, 126.

BRENTHIA. (Clemens.)*

B. PAVONICELLA, Clem.—Tin. Nor. Amer. 41, 134.—Proc. Acad. Nat. Sci. Phila. 1860, 172.

B. INFLATELLA, Clem.—Tin. Nor. Amer. 209.—Proc. Ent. Soc. Phila. ii. 5.

B. VIRGINIELLA, Clem—Tin. Nor. Amer. 257.—Proc. Ent. Soc. Phila. iii. 505.

(?BRYOTROPHA.)

(*?B. operculella*, Zell. *vid. Gelechia operculella, post.*)

BUCCULATRIX. (Zeller.)

(*B. albella*, Cham. = *B. staintonella*, *post.*)

B. AGNELLA, Clem.—Tin. Nor. Amer. 147.—Proc. Acad. Nat. Sci. Phila. 1860, 211.

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* Zeller (Verh. z.-b. Gesell. Wien, xxv. 320) refers these species to *Choreutis*.

B. **AMBROSIÆFOLIELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 119.

B. **CANADENSISELLA**, Cham.—Can. Ent. vii. 146.

B. **CAPITIALBELLA**, Cham.—Can. Ent. v. 150.

B. **CORONATELLA**, Clem.—Tin. Nor. Amer. 109.—Proc. Acad. Nat. Sci. 1860, 13.—Can. Ent. v. 151.

B. **IMMACULATELLA**, Cham.—Can. Ent. vii. 54.

B. **LITIGIOSELLA**, Zell.—Bei. z. Kennt. 1875, 148.

B. **LUTEELLA**, Cham.—Can. Ent. v. 151; x. p. —.

B. **MAGNELLA**, Cham.—Can. Ent. vii. 54.

B. **NIVEELLA**, Cham.—Can. Ent. vii. 54.

B. **OBSCUROFASCIELLA**, Cham.—Can. Ent. v. 150.

B. **PACKARDELLA**, Cham.—Can. Ent. v. 151.—Cin. Quar. Jour. Sci. ii. 120.

B. **POMIFOLIELLA**, Clem.—Tin. Nor. Amer. 146.—Proc. Acad. Nat. Sci. Phila. 1860, 211.—Can. Ent. v. 150.—Bei. z. Kennt. 1875, 147.—Rep. Nox. Ins. Mo. n. 4, 49.

B. **QUINQUENOTELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 120.

B. **STAINTONELLA**, Cham.

(*B. albella*, Cham.—Hayd. Bul. Geo. Sur. iii. 140. This species was named and described in Colorado, without access to libraries, &c. On my return from there, I found that Mr. Stainton had recently described, by the same name, a species from Syria. I therefore rename this species for that distinguished entomologist.)

B. **THUIELLA**, Packard—Am. Nat. v. 152.—Rep. Nox. Ins. Mo. n. 4, 51.

B. **TRIFASCIELLA**, Clem.—Tin. Nor. Amer. 272.—Proc. Ent. Soc. Phila. v. 147.—Can. Ent. v. 149.—Cin. Quar. Jour. Sci. ii. 120.

BUTALIS. (Treit.)

B.? **ALBAPENNELLA**, Cham.—Can. Ent. vii. 11.

B. **BASILARIS**, Zell.—Lin. Ent. x. 230.—Tin. Nor. Amer. 40.

B. **BREVISTRIGA**, Cham.—Can. Ent. vii. 10, 54 (misprinted *buristriga*).—*Ante*, p. —.

(*B. cerealella*, *vid. Gelechia cerealella.*)

B **DORSIPALLIDELLA**, Cham.—Can. Ent. vii. 10, 54. *Ante*, p. —.

B. **EBORACENSIS**, Zell.—Bei. z. Kennt. 1873, 94.

B. **FLAVIFRONTELLA**, Clem.—Tin. Nor. Amer. 40, 126.—Proc. Acad. Nat. Sci. Phil. 1860, 169.—Can. Ent. vi. 8.—Bei. z. Kennt. 1873, 92. ? = *basilaris*, Zell.

B. **FUSCICOMELLA**, Clem.—Tin. Nor. Amer. 126.—Proc. Acad. Nat. Sci. Phila. 1860, 169.—Can. Ent. vi. 8.—Bei. z. Kennt. 1873, 92.

B. **IMMACULATELLA**, Cham.—Can. Ent. vii. 10.—Hayd. Bul. Geo. Sur. iii. 144.—*Ante*, p. —. (? = *eboracensis*, Zell.)

B. **IMPOSITELLA**, Zell.—Lin. Ent. x. 241.

B. **MATUTELLA**, Clem.—Tin. Nor. Amer. 40, 127.—Proc. Acad. Nat. Sci. Phila. 1860, 169. ? = *impositella*, Zell.

B. PILOSELLA, Zell.—Bei. z. Kennt. 1873, 93.
B. PLANIPENNELLA, Cham.—Can. Ent. vii. 10 (misprinted *plausipennella*).
B. TRIVINCTELLA, Zell.—Bei. z. Kennt. 1873, 92.—*Ante*, 93.

(CALLIMA. Clemens.)

(*C. argenticinctella*, Clem. *vid. Œcophora argenticinctella.*)

CATASTEGA. (Clemens.)

C. ACERIELLA, Clem.—Tin. Nor. Amer. 178.—Proc. Ent. Soc. Phila. i. 87.
C. HAMAMELIELLA, Clem.—*Ibid.*
C. TIMIDELLA, Clem.—*Ibid.*

The larvæ only of these three species are known, and they probably do not belong in *Tineina.*

CEMIOSTOMA. (Zeller.)

C. ALBELLA, Cham.—Can. Ent. iii. 23, 209.

(CEROSTOMA.)

(*C. brasicella*, Fitch, *vid. Plutella cruciferarum, post.*)

(CERATOPHORA.)

(*C. fullonella*, *vid. Gelechia fullonella, post.*)

(CHÆTOCHILUS.)

(The following species, placed by Dr. Fitch in *Chætochilus*, will be found under *Ypsolophus:—contubernalellus*, *malifoliellus*, *pometellus*, *trimaculellus*, and *ventrellus.*)

CHAULIODUS. (Treit.)

C. CANICINCTELLA, Clem.—Tin. Nor. Amer. 236.—Proc. Ent. Soc. ii. 129.

CHRYSOCORYS. Curtis.

C. ERYTHRIELLA, Clem.—Tin. Nor. Amer. 40, 132.—Proc. Acad. Nat. Sci. Phila. 1860, 171.

(CHRYSOPELEIA. Chambers.)

(*C. purpuriella*, Cham. *vid. Æœa purpuriella*, Cham.)

(CHRYSOPORA. Clemens.)

(*C. lingualacella*, Clem. = *Gelechia hermanella*, var.)

CIRRHA. Chambers.

C. **PLATANELLA**, Cham.—Can. Ent. iv. 146.
(*Depressaria albisparsella*, Cham.—Can. Ent. iv. 92, 128.)

CLEODORA. (Curtis.)

C. **PALLIDELLA**, Cham.—Can. Ent. vi. 245.—*Ante*, 91.
C. **PALLIDESTRIGELLA**, Cham.—Can. Ent. vi. 245.—*Ante*, 92.

COLEOPHORA. (Zeller.)

C. **ÆNUSELLA**, Cham.—Can. Ent. vi. 128.
C. **ALBACOSTELLA**, Cham.—Can. Ent. vii. 95.—*Ante*, 93.
C. **ARGENTELLA**, Cham.—Can. Ent. x. p. —.
(*C. argentialbella*, Can. Ent. vii. 75.—Hayd. Bul. Geo. Sur. iii. 133, 141. *Nec* Can. Ent. vi. 128.)
C. **ARGENTIALBELLA**, Cham.—Can. Ent. vi. 128; x. p. —.
C. **ARTEMISICOLELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 133, 144.
C. **AUROPURPURIELLA**, Cham.—Can. Ent. vi. 130.
C. **BIMINIMMACULELLA**, Cham.—*Ante*, 94.
C. **BISTRIGELLA**, Cham.—Can. Ent. vii. 75; ix. 14, 72; x. p. —.—Hayd. Bul. Geo. Sur. iii. 133, 134.
C. **CÆNOSIPENNELLA**, Clem.—Tin. Nor. Amer. 88; Proc. Acad. Nat. Sci. 1860, 5.
C. **CARYÆFOLIELLA**, Cham. (& Clem. ?).—Tin. Nor. Amer. 166.—Proc. Ent. Soc. Phil. i. 78.—Can. Ent. x. p. —.
C. **CINERELLA**, Cham.—*Ante*, 93.
C. **CONCOLORELLA**, Clem.—Tin. Nor. Amer. 211.—Proc. Ent. Soc. Phila. ii. 6.—Can. Ent. vi. 129.
(*C. coracipennella, vid. C. occidentalis.*)
C. **CORRUSCIPENNELLA**, Clem.—Tin. Nor. Amer. 39, 88.—Proc. Acad. Nat. Sci. 1860, 4.—Can. Ent. vii. 124.—Guide, 351. = ? *C. fabriciella*, Bei. z. Kennt. 1873, 111.
C. **CORYLIFOLIELLA**, Clem.—Tin. Nor. Amer. 166.—Proc. Ent. Soc. Phila. i. 79.
C. **CRATIPENNELLA**, Clem.—Tin. Nor. Amer. 258.—Proc. Ent. Soc. Phila. iii. 506.
C. **CRETATICOSTELLA**, Clem.—Tin. Nor. Amer. 89.—Proc. Acad. Nat. Sci. Phila. 1860, 5.—Can. Ent. vii. 124.
(*C. fabriciella, vid. C. corruscipennella.*)
C. **FAGICORTICELLA**, Cham.—Can. Ent. vi. 129; x. p. —.
C. **FUSCOSTRIGELLA**, Cham.—*Ante*, 93.
C. **GIGANTELLA**, Cham.—Can. Ent. vi. 128; x. p. —.
C. **INFUSCATELLA**, Clem.—Tin. Nor. Amer. 89.—Proc. Acad. Nat. Sci. Phila. 1860, 5.
C. **LATICORNELLA**, Clem.—Tin. Nor. Amer. 88.—Proc. Acad. Nat. Sci. Phila. 1860, 5.

C. LINEAPULVELLA, Cham.—Can. Ent. vi. 130; x. p. —.

C. LEUCOCHRYSELLA, Clem.—Tin. Nor. Amer. 211.—Proc. Ent. Soc. Phila. ii. 6.

C. LUTEOCOSTELLA, Cham.—Cin. Quar. Jour. Sci. ii. 294.—Hayd. Bul. Geo. Sur. iii. 133.

(*C. mayrella*, H. *vid. corruscipennella.*)

C. MULTIPULVELLA, Cham.—*Ante*, 93.

C. NIGRELLA, Haw.—Bei. z. Kennt. 1873, 109.

C. NIGERLINEELLA, Cham.—Can. Ent. viii. 172.

C. OCHRELLA, Cham.—*Ante*, p. —.

C. OCCIDENTALIS?, Zell.—Bei. z. Kennt. 1873, 109. (? = *nigricella.*)

C. OSTRYÆ, Clem.—Tin. Nor. Amer. 167.—Proc. Ent. Soc. Phila. i. 79.

C. PRUNIELLA, Clem.—Tin. Nor. Amer. 167.—Proc. Ent. Soc. Phila. i. 79.—Bei. z. Kennt. 1873, 109.

C. QUADRILINEELLA, Cham.—*Ante*, 94.

C. QUERCIELLA, Clem.—Tin. Nor. Amer. 168.—Proc. Ent. Soc. Phila. i. 79.

C. ROSACELLA, Clem.—Tin. Nor. Amer. 251.—Proc. Ent. Soc. Phila. ii. 6.—Guide, 350.

C. ROSÆFOLIELLA, Clem.—Tin. Nor. Amer. 250.—Proc. Ent. Soc. Phila. ii. 6.—Guide, 350.

(*C. rufolutcella*, Cham.—Can. Ent. vi. 129. *Vid. caryæfoliella*, *ante.*)

C. SHALERIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 116.

C. SPARSIPULVELLA, Cham.—Cin. Quar. Jour. Sci. ii. 294.—Hayd. Bul. Geo. Sur. iii. 133.

C. TEXANELLA, Cham.—*Ante*, 93.

C. TILLIÆFOLIELLA, Clem.—Tin. Nor. Amer. 168.—Proc. Ent. Soc. Phila. i. 79.

C. TRILINEELLA, Cham.—Can. Ent. vii. 95.

C. UNICOLORELLA, Cham.—Can. Ent. vi. 129; x. p. —.

C. VERONIÆELLA, Cham.—Can. Ent. x. p. —.

C. VIBURNELLA, Clem.—Tin. Nor. Amer. 167.—Proc. Ent. Soc. Phila. i. 79.

C. ZELLERIELLA, Cham.—Can. Ent. vi. 128.

CORISCIUM. (Zeller.)

C. ALBANOTELLA, Cham.—Can. Ent. iv. 25; ix. 123.—Cin. Quar. Jour. Sci. i. 200.—Hayd. Bul. Geo. Sur. iii. pt. 1, 132.

C. PARADOXUM, Frey & Boll.—S. E. Z. xxxiv. 205.—Cin. Quar. Jour. Sci. i. 200.

(*C. quinquenotella*, Cham.—Can. Ent. ix. 126, 124. = *Gracilaria fasciella.*)

C. QUINQUESTRIGELLA, Cham.—Can. Ent. vii. 75; ix. 14, 124; x. p. —.

CORISCIUM, sp.?—Hayd. Bul. Geo. Sur. iii. 132.

(COSMIOTES. Clemens.)

(*Cosmiotes* = *Elachista*, which see for species *illictella*, *maculosella*, and *madarella* of Clem.)

COSMOPTERYX. (Hübner.)

C. **GEMMIFERELLA**, Clem.—Tin. Nor. Amer. 99, 100.—Proc. Acad. Nat. Sci. Phila. 1860, 10.—Cin. Quar. Jour. Sci. ii. 231.
C. **CLEMENSELLA**, Staint.—Tin. Nor. Amer. 39, 100.—Ent. Week. Int. ix. 31.
C. **PULCHERRIMELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 231.
C. **MONTISELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 297.—Hayd. Bul. Geo. Sur. iii. pt. 1, 134.
C. **4-LINEELLA**, Cham.—*Ante*, 95.

CRYPTOLECHIA.

C. **ATROPICTA**, Zell.—Bei. z. Kennt. 1875, 137.
C. **CRETACEA**, Zell.—Bei. z. Kennt. 1873, 43.
C. **CRYPTOLECHIÆELLA**, Cham.—*Ante*, 84.
(*Depressaria cryptolechiæella*, Cham.)—Can. Ent. iv. 90, 129 *et seq.* 147.
(*Hagno cryptolechiæella* Cham.)
C. **FAGINELLA**, Cham.—*Ante*, 84.
(*Hagno faginella*, Cham.)—Can. Ent. iv. 131; vi. 231
C. **FERUGINOSA**, Zell.—Bei. z. Kennt. 1873, 43.
C. **LITHOSINA**, Zell.—Bei. z. Kennt. 1873, 44.
C. **NEBEOULOSA**, Zell.—Bei. z. Kennt. 1873, 45.
C. **OBSOLETELLA**, Zell.—Bei. z. Kennt. 1873, 42.
C. **OBSCUROMACULELLA**, Cham.—*Ante*, 86.
C. **PIPERATELLA**, Zell.—Bei. z. Kennt. 1873, 39.
C. **QUERCICELLA**, Clem.—Bei. z. Kennt. 1873, 40.—Lep. West. Amer. 1874, 17.
(*Psilocorsis quercicella* Clem.)—Tin. Nor. Amer. 149.—Proc. Acad. Nat. Sci. Phila. 1860, 212.—*Ante*, p. —.—Can. Ent. iv. 131.
C. **REFLEXA**, Clem.
(*Psilocorsis reflexa*, Clem.)—Tin. Nor. Amer. 149.—Proc. Acad. Nat. Sci. Phila. 1860, 212.
C. **SCHLÆGERI**, Zell.—Bei. z. Kennt. 1873, 46.—Lin. Ent. 9, s. 372.
C. **TENTORIFERELLA**, Clem.
(*Machimia tentoriferella*, Clem.)—Tin. Nor. Amer. 148.—Proc. Acad. Sci. Nor. Amer. 1860, 212.—Bei. z. Kennt. 1873, 40.—*Ante*, 84.
C. **VESTALIS**, Zell.—Bei. z. Kennt. 1873, 47.

CYCLOPLASIS. (Clemens.)

C. **PANICIFOLIELLA**, Clem.—Tin. Nor. Amer. 248.—Proc. Ent. Soc. Phila. ii. 422.

CYANE. (Chambers.)

C. **VISALIELLA**, Cham.—Can. Ent. v. 113.

DASYCERA.* (Haw.)

D. NEWMANELLA, Clem.—Tin. Nor. Amer. 252.—Proc. Ent. Soc. Phila. ii. 428.—Bei. z. Kennt. 1873, 89.

D. NONSTRIGELLA, Cham.—*Ante*, 92.

DEPRESSARIA. (Haw.)

(*D. albisparsella*, Cham. *vid. Cirrha platanella*, Cham.)

D. ATRODORSELLA, Clem.—Tin. Nor. Amer. 230.—Proc. Ent. Soc. Phila. ii. 124.—Can. Ent. iv. 91.—An. Ly. Nat. Hist. ix. 156.—Guide, 349.—Bei. z. Kennt. 1873, 33.

(*D.? bicostomaculella* Cham., *D.? bistrigella* Cham., *D.? bimaculella* Cham., and *D.? cercerisella* Cham., all referred to *Gelechia*, which see.)

D. CINEREOCOSTELLA, Clem.—Tin. Nor. Amer. 245.—Proc. Ent. Soc. ii. 422.—Can. Ent. iv. 91.—An. Ly. Nat. Hist. ix. 155.

(*D.? cryptolechiella* Cham. referred to *Cryptolechia*.)

D. EUPATORIIELLA, Cham.—*Ante*, 82.

D. FERNALDELLA, Cham.—*Ante*, 83.

(*D.? fuscoochrella* Cham. and *D.? fuscoluteella* Cham. referred to *Gelechia*.)

D. GROTEELLA, Robinson.—An. Ly. Nat. Hist. ix. 157.

D. HERACLIANA, DeG.—Lin. Ent. ix. s. 312.—Her.-Schf. in Sch. v. Eu. v. f. 445.—Nat. Hist. Tin. i. 113.

(*D. ontariella*, Bethune.)—Can. Ent. ii. 3, 19; v. 82.—Bei. z. Kennt. 1873, 35.

D. HILARELLA, Zell.—Bei. z. Kennt. 1873, 34.

D. LECONTELLA, Clem.—Tin. Nor. Amer. 137.—Proc. Acad. Nat. Sci. Phila. 1860, 174.—Can. Ent. iv. 146.—An. Ly. Nat. Hist. ix. 157.

D. NEBULOSA, Zell.—Bei. z. Kennt. 1873, 37.

(*D.? obscurusella* Cham. referred to *Gelechia*.)

(*D. ontariella*, Bethune, = *D. heracliana*, DeG. *supra*.)

D.? PALLIDOCHRELLA, Cham.—Can. Ent. iv. 126, 129, 147, 148. (Should probably be referred to *Gelechia*.)

(*D.? pseudacaciella* Cham. referred to *Gelechia*.)

D. PULVIPENNELLA, Clem.—Tin. Nor. Amer. 244.—Can. Ent. iv. 91.—An. Ly. Nat. Hist. ix. 157.

(*D.? querciella* Cham. referred to *Gelechia*.)

D.? RILEYELLA, Cham.—Can. Ent. iv. 106, 129, 147, 148. (Should probably be referred to *Gelechia*.)

D. ROBINIELLA, Pack.—Guide, 349.—Can. Ent. iv. 107.—Cin. Quar. Jour. Sci. vi. 208.

D. SCABELLA, Zell.—Bei. z. Kennt. 1873, 36.

D.? VERSICOLORELLA, Cham.—Can. Ent. iv. 127, 129, 147, 148. (Should probably be referred to *Gelechia*.)

DIACHORISA. (Clemens.)

D. **VELATELLA**, Clem.—Lin. Nor. Amer. 107.—Proc. Acad. Nat. Sci. Phila. 1860, 13.

(DORYPHORA.)

(*D. piscipelis, vid. Gelechia piscipelis.*)

DRYOPE. (Chambers.)

D. **MURTFELDTELLA**, Cham.—Can. Ent. vi. 50.
(*D. luteopulvella*, Cham.—Can. Ent. vii. 73. Var. *D. murtfeldtella.*)

EIDO. (Chambers.)

E. **ALBAPALPELLA**, Cham.—Can. Ent. v. 72.
(*Venilia albapalpella*, Cham.—Can. Ent. iv. 207.)

(EIDOTHEA, Chambers.)

(*E. vagatioella, vid. Gelechia vagatioella, post.*)

ELACHISTA. (Treit.)

E. **BRACHYELYTRIFOLIELLA**, Clem.—Tin. Nor. Amer. 248.—Proc. Ent. Soc. Phila. 1860, 425.
E.? **CRISTATELLA**, Cham.—Can. Ent. viii. 172.
E. **CONCOLORELLA**, Cham.—Can. Ent. vii. 55.
E. **ILLICTELLA**, Clem.
(*Cosmiotes illictella*, Clem.)—Tin. Nor. Amer. 98.—Proc. Acad. Nat. Sci. Phila. 1860, 9.
E. **INORNATELLA**, Cham.—Can. Ent. vii. 93.
E. **MACULOSEELLA**, Clem.
(*Cosmiotes maculoseella*, Clem.)—Tin. Nor. Amer. 98.—Proc. Acad. Nat. Sci. Phila. 1860, 9.
E. **MADARELLA**, Clem.
(*Cosmiotes madarella*, Clem.)—Tin. Nor. Amer. 98.—Proc. Acad. Nat. Sci. Phila. 1860, 9.
E.? **ORICHALCELLA**, Clem.—Tin. Nor. Amer. 256.—Proc. Ent. Soc. Phila. ii. 430.—Guide, 352.
E. **PARVIPULVELLA**, Cham.—Can. Ent. vii. 56.
E. **PRÆMATURELLA**, Clem.—Tin. Nor. Amer. 133.—Proc. Acad. Nat. Sci. Phila. 1860, 172.—Can. Ent. vi. 76.—Hayd. Bul. Geo. Sur. iii. pt. 1, 143.
E. **STAINTONELLA**, Cham.—*Ante*, 96.
E. **TEXANELLA**, Cham.—*Ante*, 96.
E. **UNIFASCIELLA**, Cham.—Can. Ent. vii. 147.

ENÆMIA. (Zeller.)

E. PSAMMITIS, Zell.—Bei. z. Kennt. 1872, 116; 1875, 139.
(*Mieza subfervens*, Wkr.)—List Bomb. ii. 528.
(*Eustixis subfervens*, Grote.)—Bul. Buff. Soc. ii. 152.
E. CRASSINERVELLA, Zell.—Bei. z. Kennt. 1872, 116; 1875, 139.
(*Mieza igninix*, Wkr.)—List Bomb. ii. 527.
(*Eustixis igninix*, Grote.)—Bul. Buff. Soc. ii. 152.

ENCHRYSA. (Zeller.)

E. DISSECTELLA, Zell.—Bei. z. Kennt. 1873, 83.

ENDROSIS. (Hübner.)

E. FENESTRELLA, Scop.—Cin. Quar. Jour. Sci. ii. 244.
(*E. kennicottella*, Clem.)—Tin. Nor. Amer. 119.—Proc. Acad. Nat. Sci. Phila. 1860, 165.

ENICOSTOMA? (Steph.)

E.? PACKARDELLA, Clem.—Tin. Nor. Amer. 231.—Proc. Ent. Soc. Phila. ii. 125.

EPICORTHYLIS. (Zeller.)

E. INVERSELLA, Zell.—Bei. z. Kennt. 1873, 48.—Can. Ent. x. p. —.

(ERGATIS.)

(*E. roseosuffusella* and *E. pudibundella*, *vid. sub Gelechia.*)

ERIPHIA. (Chambers.)

E. CONCOLORELLA, Cham.—Can. Ent. vii. 55, 56, 94.—Hayd. Bul. Geo. Sur. iii. pt. 1, 137, 141.—*Ante*, 96.
E.? ALBALINEELLA, Cham.—*Ante*, 95.
E.? NIGRILINEELLA, Cham.—*Ante*, 96.

EUDARCIA. (Clemens.)

E. SIMULATRICELLA, Clem.—Tin. Nor. Amer. 102.—Proc. Acad. Nat. Sci. Phila. 1860, 11.

EUPLOCAMUS. (Latreille.)

E.? FUSCOFASCIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 257.

EURYNOME. (Chambers.)

E. LUTEELLA, Cham.—Cin. Quar. Jour. Sci. ii. 304.—Hayd. Bul. Geo. Sur. iii. pt. 1, 140.
E. ALBELLA, Cham.—Hayd. Bul. Geo. Sur. iii. pt. 1, 140.

(EUSTIXIS, *vid.* ENÆMIA, *supra.*)

EVAGORA. (Clemens.)

E. APICITRIPUNCTELLA, Clem.—Tin. Nor. Amer. 120.—Proc. Acad. Nat. Sci. Phila. 1860, 165.

EVIPPE. (Chambers.)

(*E. prunifoliella*, Cham. *vid. Gelechia prunifoliella*, Cham.)

GELECHIA. (Zeller.)

G. ADERUCELLA, Zell.—Can. Ent. iv. 125.

G. ÆQUEPULVELLA, Cham.—Can. Ent. iv. 192; vi. 230 *et seq.*—Cin. Quar. Jour. Sci. ii. 246.—Hayd. Bul. Geo. Sur. iii. pt. 1, 125, 141.

G. AGRIMONIELLA, Clem.—Tin. Nor. Amer. 40, 112.—Proc. Ent. Soc. Phila. ii. 120.—Proc. Acad. Nat. Sci. Phila. 1860, 162.

G. ALACELLA, Clem.

(*Trichotaphe alacella* Clem.)—Tin. Nor. Amer. 180.—Proc. Ent. Soc. Phila. i. 132.

G. ALBILORELLA, Zell.—Bei. z. Kennt. May, 1872, 61.

G. ALBOMARGINELLA, Cham.—Cin. Quar. Jour. Sci. ii. 291.—Hayd. Bul. Geo. Sur. iii. 128.

G. ALBOMACULELLA, Cham.—Can. Ent. vii. 209.

G. ALEXANDRIÆELLA, Cham.

(*Adrasteia alexandriæella*, Cham.)—Can. Ent. iv. 149.

G. AMBROSIÆELLA, Cham.—Cin. Quar. Jour. Sci. ii. 239.

G. AMORPHÆELLA, Cham.—Hayd. Bul. Geo. Sur. iii. pt. 1, 126.

G. ANGUSTIPENNELLA, Clem.—Tin. Nor. Amer. 222, 224.—Proc. Ent. Soc. Phila. ii. 119.

G. APICILINEELLA, Clem.—Tin. Nor. Amer. 223, 224.—Proc. Ent. Soc. Phila. 120.

G. APICISTRIGELLA, Cham.—Can. Ent. iv. 175.

(*Parasia apicistrigella*, Cham.—*Ibid.* 66.)

G. ARGENTIALBELLA, Cham.—Can. Ent. vi. 241.

G. AURIMACULELLA, Cham.—Can. Ent. iv. 172.

G. BADIOMACULELLA, Cham.—Can. Ent. iv. 192.

G. BASISTRIGELLA, Zell.—Bei. z. Kennt. 1873, 70.

(*Pœcilia basistrigella.*)

G. BASIFASCIELLA, Zell.—Bei. z. Kennt. 1873, 70.

G. BELANGERELLA, Cham.—Can. Ent. vii. 210.

G. BICOSTOMACULELLA, Cham.—Hayd. Bul. Geo. Sur. iii. pt. 1, 127.

G. BICRISTATELLA, Cham.—Can. Ent. vii. 210.

G. BIDISCOMACULELLA, Cham.—Can. Ent. vi. 241.

G. BILOBELLA, Zell.—Bei. z. Kennt. 1873, 80.

(*Malacotricha bilobella.*)

G. BIMACULELLA, Cham.

(*Depressaria bimaculella*, Cham.)—Can. Ent. iv. 108, 128, 147, 148.

G. BISTRIGELLA, Cham.
(*Depressaria bistrigella*, Cham.)—Can. Ent. iv. 28, 92, 147, 148.
G.? BOSQUELLA, Cham.—Can. Ent. vii. 124.
(*Œcophora bosquella*.—Can. Ent. vii. 92.—*Ante*, 87.)
G. BRUMELLA, Clem.—Tin. Nor. Amer. 239.—Proc. Ent. Soc. Phila. ii. 416.
G. CAECELLA, Zell.—Bei. z. Kennt. 1873, 52.
G. CANOPULVELLA, Cham.—*Ante*, 91.
G. CAPITEOCHRELLA, Cham.—Cin. Quar. Jour. Sci. ii. 252.
G. CERCERISELLA, Cham.—Can. Ent. vi. 230, 231; ix. 23.
(*Depressaria cercerisella*, Cham.—Can. Ent. iv. 108, 128, 147, 148.)
G. CEREALELLA.—Tin. Nor. Amer. 112, 224.—Proc. Acad. Nat. Sci. Phila. 1860, 162.—Ag. Rep. 1854, 67; 1858, 23; 1864, 556.
(*Anacampsis* (*Butalis*) *cerealella*, Harris.)—Treat. Ins. 392, 499, 506.—Guide, 350.
(*Aleucita cerealella*, Oliv., *Œcophora cerealella*, Lat., *Tinea hordei*, K. & S., and *Ypsolophus granulellus*, K. & S.)—Ont. Rep. 1871, 61.
(*Butalis cerealella*, Fitch.)—Report, n. 7, 127.
G. CHAMBERSELLA, Murt.—Can. Ent. vi. 222.—Cin. Quar. Jour. Sci. ii. 240.
G. CONSONELLA, Zell.—Bei. z. Kennt. 1873, 51.
(*Tachyptilia consonella*.)
G.? CILIALINEELLA, Cham.—Can Ent. vi. 242.—*Ante*, 91.
G. CLEMENSELLA, Cham.—Can. Ent. ix. 103.
G. COLLINUSELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 128.
G. CONCINUSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 253.—Hayd. Bul. Geo. Sur. iii. pt. 1, 127.
G. CONFUSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 251.
G. COSTORUFOELLA, Cham.—Can. Ent. vi. 240.
G. CRESCENTIFASCIELLA, Cham.—Can. Ent. vi. 237.—Cin. Quar. Jour. Sci. ii. 255.—*Ante*, p. —.
G. CRISTATELLA, Cham.—Cin. Quar. Jour. Sci. ii. 241.
G. CRISTIFASCIELLA, Cham.—*Ante*, p.
G. CURVILINEELLA, Cham.—Can. Ent. iv. 172.
G. 10-MACULELLA, Cham.—Cin. Quar. Jour. Sci. ii. 290.—Hayd. Bul. Geo. Sur. iii. pt. 1, 128.
G. DEPRESSOSTRIGELLA, Cham.—Can. Ent. vi. 236.—Cin. Quar. Jour. Sci. ii. 255.
G.? DETERSELLA, Clem.—Tin. Nor. Amer. 40, 116, 225.—Proc. Acad. Nat. Sci. Phila. 1860, 164.
G. DIFFICILISELLA, Cham.—Can. Ent. iv. 192; v. 186, 187, 185, 229.
(*Evagora difficilisella*, Cham.)—Can. Ent. iv. 66.
(*Taygete difficilisella*, Cham.)—Can. Ent. v. 231; vii. 105; viii. 19.

G. DISCOANULELLA, Cham.—Cin. Quar. Jour. Sci. ii. 254.

G. DISCOMACULELLA, Cham.—Can. Ent. iv. 172.—Cin. Quar. Jour. Sci. ii. 239.

G. DISCONOTELLA, Cham.—*Ante*, 86.

G. DISCOOCELLA, Cham.—Can. Ent. iv. 194; vi. 231.—Cin. Quar. Jour. Sci. ii. 237.

G. DISCOSTRIGELLA, Cham.—Cin. Quar. Jour. Sci. ii. 248.

G. DORSIVITTELLA, Zell.—Bei. z. Kennt. 1873, 67.
(*Teleia dorsivittella* —*Ibid.*)

G. (CRYPTOLECHIA?) DUBITELLA.
(*Depressaria dubitella*, Cham.)—Can. Ent. iv. 90 *et seq.* 128, 147; vi. 221.

G. ELEGANTELLA, Cham.—Can. Ent. vi. 239; ix. 23. (Erroneously by MS. name *superbella*, Can. Ent. vii. 32.)

G. FLAVOCOSTELLA.
(*Trichotaphe flavocostella*, Clem.)—Tin. Nor. Amer. 113, 180.—Proc. Acad. Nat. Sci. Phila. 1860, 162.—Proc. Ent. Soc. Phila. i. 131.—Bei. z. Kennt. 1873, 79.

G. FLEXURELLA, Clem.—Tin. Nor. Amer. 115, 225.—Proc. Acad. Nat. Sci. Phila. 1860, 163.—Proc. Ent. Soc. Phila. ii. 122.

G. FRAGMENTELLA, Zell.—Bei. z. Kennt. 1873, 71.
(*Poecilia fragmentella.*)

G. FULLONELLA, Zell.—Bei. z. Kennt. 1873, 76.
(*Ceratophora fullonella.*)

G. FUNGIVORELLA, Clem.—Tin. Nor. Amer. 261.—Proc. Ent. Soc. Phila. iii. 507; vi. 273.—Guide, 350.

G. FUSCOLUTEELLA, Cham.
(*Depressaria fuscoluteella*, Cham.)—Can. Ent. iv. 106, 129, 147.

G. FUSCOMACULELLA, Cham.—Can. Ent. iv. 170.

G. FUSCOOCHRELLA, Cham.
(*Depressaria fuscoochrella*, Cham.)—Can. Ent. iv. 106, 128, 147, 148.

G. FUSCOPALLIDELLA, Cham.
(*Sinoe fuscopallidella*, Cham.)—Can. Ent. v. 231; vii. 105; ix. 24.

G. FUSCOPULVELLA, Cham.—Can. Ent. iv. 170.—Cin. Quar. Jour. ii. 245.

G. FUSCOPUNCTELLA, Clem.—Tin. Nor. Amer. 218, 225.—Proc. Ent. Soc. Phila. ii. 12, 121.

G. FUSCOTÆNIAELLA, Cham.—*Ante*, 89.

G. GALLÆGENITELLA, Clem.—Tin. Nor. Amer. 242, 259.—Proc. Ent. Soc. Phila. ii. 420; iii. 506; vi. 273.

G. GALLÆSOLIDAGINIS, Riley.—Rep. Nox. Ins. Mo. n. 1, 173; n. 2, 20, 132, 134.—Can. Ent. viii. 19; ix. 14.—Cin. Quar. Jour. Sci. ii. 289.—Hayd. Bul. Geo. Sur. iii. pt. 1, 28, 141.

G. GEMINELLA, Lin.—Can. Ent. iii. 195 (*? gemmella*).

G. GILVOLINEELLA, Clem.—Tin. Nor. Amer. 223 *et seq.*—Proc. Ent. Soc. Phila. ii. 119 *et seq.*

G. GILVOMACULELLA, Clem.—Tin. Nor. Amer. 219, 225.—Proc. Ent. Soc. Phila. ii. 12, 121.

G. GILVOSCOPELLA, Zell.—Bei. z. Kennt. 1873, 66.
(*Teleia gilvoscopella.*)

(*G. glandulella*, Riley, *vid. Blastobasis glandulella.*)

G. GLANDIFERELLA, Zell.—Bei. z. Kennt. 1873, 75.
(*G. sella*, Cham.)—Can. Ent. vi. 238; ix. 14, 23.

G. GLEDITSCHIÆELLA, Cham.—Can. Ent. x. p. —.
(*Helice* (*Gelechia*) *pallidochrella*, Cham.—Can. Ent. v. 188, 229; vii. 105; ix. 15; x. 231.)

G. GLOCHINELLA, Zell.—Bei. z. Kennt. 1873, 63.

G. GLYCYRRHIZÆELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 124.

G. GRISELLA, Cham.—Can. Ent. iv. 171.

G. GRISSEELLA, Cham.
(*Parasia? grisseella*, Cham.)—Can. Ent. iv. 88.

G. GRISSEFASCIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 253.

G. GRISSEOCHRELLA, Cham.—Cin. Quar. Jour. Sci. ii. 247.

G. HERMANELLA, Fab.—Nat. Hist. Tin. ix. 263.—Can. Ent. iv. 67, 169, 173; x. p. —.—Ent. Mo. Mag. xi. 279.

G. INÆQUEPULVELLA, Cham.—Cin. Quar. Jour. Sci. ii. 239.

G. INNOCUELLA, Zell.—Bei. z. Kennt. 1873, 49.
(*Tachyptilia innocuella.*)

G. INTERMEDIELLA, Cham.—*Ante*, 89.

G. JUNCIDELLA, Clem.
(*Trichotaphe juncidella*, Clem.)—Tin. Nor. Amer. 122.—Proc. Acad. Nat. Sci. Phila. 1860, 166.

G. LABRADORICA, Moeschler.—Can. Ent. iv. 125.

G. LABRADORIELLA, Clem.—Nat. Hist. Tin. 220, 224, 239—Proc. Ent. Soc. Phila. ii. 12, 120.

G. LACTEUSOCHRELLA, Cham.—Cin. Quar. Jour. Sci. ii. 244.

G. LACTIFLOSELLA, Cham.—*Ante*, 89.

G. LATIFASCIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 251.

G. LITUROSELLA, Zell.—Bei. z. Kennt. 1873, 65.
(*Lita liturosella.*)

G. LEUCONOTA, Zell.—Bei. z. Kennt. 1873, 68.
(*Teleia leuconota.*)

G. LONGIFASCIELLA, Clem.—Tin. Nor. Amer. 219, 225.—Proc. Ent. Soc. Phila. ii. 12, 122.
(*Telphusa curvistrigella*, Cham.)—Can. Ent. iv. 132, 174.

G. LYNCEELLA, Zell.—Bei. z. Kennt. 1873, 55.

G. MACULATUSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 245.

G. MACULOMARGINELLA, Cham.—Can. Ent. vi. 241.

G. MARMORELLA, Cham.—Cin. Quar. Jour. Sci. ii. 239.

G. MEDIOFUSCELLA, Clem.—Tin. Nor. Amer. 218, 224.—Proc. Ent. Soc. Phila. ii. 11, 121.

G. MILLERIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 253.

G. MIMELLA, Clem.—Tin. Nor. Amer. 116, 225.—Proc. Acad. Nat. Sci. Phila. 1860, 163.—Proc. Ent. Soc. Phila. ii. 121.

G. MINIMMACULELLA, Cham.—Can. Ent. vi. 235.

G. MINIMELLA, Cham.—Can. Ent. vi. 243.

G. MONUMENTELLA, Cham.—Hayd. Bul. Geo. Sur. i. 11, 125.

G. MULTIMACULELLA, Cham.—*Ante*, 89.

G. NIGRATOMELLA, Clem.—Tin. Nor. Amer. 217, 224, 260.—Proc. Ent. Soc. Phila. ii. 11, 121; iii. 507.

G. NIGRELLA, Cham.—Cin. Quar. Jour. Sci. ii. 250, 252.

G. NIVEOPULVELLA, Cham.—Can. Ent. vii. 210.

G. NUNDINELLA, Zell.—Bei. z. Kennt. 1873, 56.

G. OBLIQUISTRIGELLA, Cham.—Can. Ent. iv. 175; ix. 24; x. p. —.

(*Anarsia obliquistrigella*, Cham.)—Can. Ent. iv. 65.

G. OBSCURELLA, Cham.—Can. Ent. iv. 170.

G. OBSCUROSUFFUSELLA, Cham.—*Ante*, 90.

G. OBSCUROOCELELLA, Cham.—Cin. Quar. Jour. Sci. ii. 254.

G. OBSCURUSELLA, Cham.

(*Depressaria obscurusella*, Cham.)—Can. Ent. iv. 106, 128 *et seq.* 148 *et seq.*

G. OCCIDENTELLA, Cham.—Cin. Quar. Jour. Sci. ii. 246.

G. OCELELLA, Cham.—Hayd. Bul. Geo. Sur. iii. pt. 1, 125.

G. OCHREOCOSTELLA, Cham.—*Ante*, 91.

G. OCHREOFUSCELLA, Cham.—Cin. Quar. Jour. Sci. ii. 249.

G. OCHREOSUFFUSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 255.

G. OCHREOSTRIGELLA, Cham.—Cin. Quar. Jour. Sci. ii. 247.—*Ante*, p. —.

G. OCHRIPALPELLA, Zell.

(*Trichotaphe ochripalpella*, Zell.)—Bei. z. Kennt. 1873, 79.

G. OCTOMACULELLA, Cham.—Cin. Quar. Jour. Sci. ii. 291.

G. OLYMPIADELLA, Zell.

(*Bryotropha olympiadella*, Zell.)—Bei. z. Kennt. 1873, 59.—Can. Ent. ix. 23.

G. OPERCULELLA, Zell.—Bei. z. Kennt. 1873, 62.

G. ORNATIFIMBRIELLA, Clem.—Tin. Nor. Amer. 242.—Proc. Ent. Soc. Phila. ii. 420.

G. PACKARDELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 143.

G. PALLIDEGRISSEELLA, Cham.—Can. Ent. vi. 237.

G. PALLIDOCHRELLA, Cham.

(*Depressaria pallidochrella*, Cham.)—Can. Ent. iv. 126, 129, 147.

G. PALLIDEROSACELLA, Cham.—*Ante*, 90.

G. PALPIALBELLA, Cham.—Cin. Quar. Jour. Sci. ii. 253.

G. PALPIANULELLA, Cham.—Can. Ent. iv. 68.

G. PALPILINEELLA, Cham.—Cin. Quar. Jour. Sci. ii. 252.—*Ante*, p. —.

G. PARVIPULVELLA, Cham.—Can. Ent. vi. 242.—Cin. Quar. Jour. Sci. ii. 228.

G. PEDMONTELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 123.

G. (DORYPHORA) PISCIPALIS, Zell.—Bei. z. Kennt. 1873, 77.

G. PHYSALIELLA, Cham.—Can. Ent. iv. 173.—Cin. Quar. Jour. Sci. ii. 238.—Hayd. Bul. Geo. Sur. iii. 128.

G. PHYSALIVORELLA, Cham.—Cin. Quar. Jour. Sci. ii. 238.

G. PLUTELLA, Cham.—Can. Ent. vi. 238.

G. PRAVINOMINELLA, Cham.

(*G.* 4-*maculella*, Cham.)—Can. Ent. x. p. —.—Cin. Quar. Jour. Sci. ii. 290.—Hayd. Bul. Geo. Sur. iii. 128. (*Vid.* 4-*maculella*.)

G. PRUNIFOLIELLA, Cham.

(*Evippe prunifoliella*, Cham.)—Can. Ent. v. 186; vii. 105; ix. 23.

G. PSEUDACACIELLA, Cham.

(*Depressaria pseudacaciella*, Cham.)—Can. Ent. iv. 9, 107, 129, 147, 148.—Cin. Quar. Jour. Sci. i. 208.

G. PUDIBUNDELLA, Zell.—Bei. z. Kennt. 1873, 73.

G. PULLIFIMBRIELLA, Clem.—Tin. Nor. Amer. 223, 225.—Proc. Ent. Soc. Phila. ii. 120, 121.—Can. Ent. ix. 23.

G. PULLUSELLA, Cham.—Can. Ent. vi. 237.

G. PUNCTIFERELLA, Clem.—Tin. Nor. Amer. 222, 224.—Proc. Ent. Soc. Phila. ii. 119, 120.

G. QUADRIMACULELLA, Cham.—Can Ent. vi. 237. (*Non* 4-*maculella*, Cin. Quar. Jour. Sci. ii. 29, *vid. pravinominella*.)

(*G. quinella*, Zell.—Bei. z. Kennt. 1873, 60. Var. *cercerisella*.—Can. Ent. vi. 230 *et seq.*; ix. 23.)

G. QUERCINIGRÆELLA, Cham.—Can. Ent. iv. 170.

G. QUERCIFOLIELLA, Cham.

(*Depressaria bicostomaculella*, Cham.)—Can. Ent. iv. 127, 128, 129, 147, 148.

Adrasteia quercifoliella, Cham.—Can. Ent. iv. 206.

Psoricoptera gibbosella, Stainton.—Can. Ent. v. 72, 174.

G. QUERCIVORELLA, Cham.—Can. Ent. iv. 173.

G. QUERCIELLA, Cham.

(*Depressaria querciella*, Cham.)—Can. Ent. iv. 127, 147.

(*Adrasteia querciella*, Cham.)—Can. Ent. iv. 207.

G. QUINQUEANULELLA, Cham.—Can. Ent. iv. 191.

G. QUINQUECRISTATELLA, Cham.—*Ante*, 88.

G. RHOIFRUCTELLA, Clem.—Tin. Nor. Amer. 40, 114, 225.—Proc. Acad. Nat. Sci. Phila. 1860, 163.—Proc. Ent. Soc. Phila. ii. 121.—Can. Ent. iv. 68.—Bei. z. Kennt. May, 1873, 52.

G. RIBESELLA, Cham.—Cin. Quar. Jour. Sci. ii. 29.—Hayd. Bul. Geo. Sur. iii. pt. 1, 128.

G. ? ROBINIELLA.

(*Anacampsis robiniella*, Fitch.)—Rep. v. 334.—Can. Ent. iii. 55, 57, 163, 183.—Tin. Nor. Amer. 208.

G. ROSEOSUFFUSELLA, Clem.—Tin. Nor. Amer. 40, 113, 225.—Proc. Acad. Nat. Sci. Phila. 1860, 162.—Proc. Ent. Soc. Phila. ii. 121.—Cham. *in* Can. Ent. iv. 69, 148, 169, 193; vi. 231; ix. 14; Cin. Quar. Jour. Sci. ii. 290; Hayd. Bul. Geo. Sur. iii. pt. 1, 125, 141.—Murt. *in* Can. Ent. vi. 222.—Zell. *in* Bei. z. Kennt. 1873, 72.

G. **RUBENSELLA**, Cham.—Can. Ent. iv. 40, 193.—Murt. *in* Can. Ent. vi. 222. (*Vid. ante sub G. intermediella.*)

G. **RUBIDELLA**, Clem.—Tin. Nor. Amer. 40, 115, 225.—Proc. Acad. Nat. Sci. Phila. 1860, 163.—Proc. Ent. Soc. Phila. ii. 121.

G. **RUFUSELLA**, Cham.—Can. Ent. vi. 240.

G. **SAPHARINELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 250

G. ? **SARCITELLA**, Har.
(*Anacampsis sarcitella*, Har.)—Treat. Ins. 493.

G. **SALICIFUNGIELLA**, Clem.—Tin. Nor. Amer. 262.—Proc. Ent. Soc. Phila. iii. 508; vi. 273.

G. **SAUNDERSELLA**, Cham.—Can. Ent. viii. 173.

G. **SCUTELLARIÆELLA**, Cham.—Can. Ent. v. 175.

(*G. sella*, Cham. = *G. glandiferella*, Zell. *q. v.*)

G. **SEQUAX**, Haw.—Nat. Hist. Tin. x. 70.—Bei. z. Kennt. 1873, 65.

G. **SERRATIPALPELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 123.

G. **SERRATIVITTELLA**, Zell.
(*Trichotaphe serrativittella*, Zell.)—Bei. z. Kennt. 1873, 80.—Can. Ent. ix. 24.

G. **SETOSELLA**, Clem.
(*Trichotaphe setosella*, Clem.)—Tin. Nor. Amer. 121.—Proc. Acad. Nat. Sci. Phila. 1860, 166.

G. **SIMPLICIELLA**, Cham.—Cin Quar. Jour. Sci. ii. 238.

(*G. similiella*, Cham. = *G. solaniiella*, *post.*)

G. **SOLANIIELLA**, Cham.
(*G. similiella*, Cham.)—Can. Ent. iv. 193; v. 176; x. p. —.—Cin. Quar. Jour. Sci. ii. 238, 239.—Hayd. Bul. Geo. Sur. iii. 143.

G. **SUBRUBERELLA**, Cham.—Can. Ent. vi. 240.—Cin. Quar. Jour. Sci. ii. 254.

G. **SUFFUSELLA**, Cham.—Can. Ent. iv. 171.

G. **SYLVÆCOLELLA**, Cham.—*Ante*, 86.

G. **TEPHRIASELLA**, Cham.—Can. Ent. iv. 68.

G. **TERNARIELLA**, Zell.—Bei. z. Kennt. 1873, 64.
(*Lita ternariella.*)

G. **THORACEALBELLA**, Cham.—Can. Ent. vi. 235.

G. **THORACEOCHRELLA**, Cham.—Can. Ent. iv. 169, 170.

G. **THORACEFASCIELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 246.—Can. Ent. x. p. —.

G. **THORACENIGRÆELLA**, Cham.—Cin. Quar. Jour, Sci. ii. 246.

G. **THORACESTRIGELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 245.

G. **TRIALBAMACULELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 250 *et seq.*

G. **TRIFASCIELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 252.—Can. Ent. vii. 23.

G. **TRILINEELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 125.

G. **TRIMACULELLA**, Cham.—Can. Ent. vi. 238.

G. **TRIOCELELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 127.—*Ante*, 87.

G. **UNCTULELLA**, Zell.—Bei. z. Kennt. 1873, 57.

G. **VAGATIOELLA**, Cham.
(*Eidothea vagatioella*, Cham.)—Can. Ent. v. 187, 229; vii. 105.

G. VIOLACEO-FUSCA, Zell.—Bei. z. Kennt. 1873, 58.
G. VARIIELLA, Cham.—Can. Ent. iv. 174.
G. VERSUTELLA, Zell.—Bei. z. Kennt. 1873, 53.
G. WACOELLA, Cham.—Can. Ent. vi. 237.

GLAUCE. (Chambers.) (= ? *Gelechia, pars.*)

G. PECTEN-ALÆELLA, Cham.—Can. Ent. vii. 12.

GLYPHIPTERYX.

G. IMPIGRITELLA, Clem.—Tin. Nor. Amer. 214.—Proc. Ent. Soc. Phila. ii. 9.—Cin. Quar. Jour. Sci. ii. 234.
G. EXOPTALELLA, Cham.—Cin. Quar. Jour. Sci. ii. 234, 293.
G. MONTISELLA, Cham.—Cin. Quar. Jour. Sci. ii. 292.—Hayd. Bul. Geo. Sur. iii. 129, 143, 149.—Can. Ent. ix. 14.

GRACILARIA. (Haw.)

G. ACERIFOLIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 299.—Hayd. Bul. Geo. Sur. iii. 132.
G. ALNICOLELLA, Cham.—Cin. Quar. Jour. Sci. ii. 299.—Hayd. Bul. Geo. Sur. iii. 132.
G. ALNIVORELLA, Cham.—Cin. Quar. Jour. Sci. ii. 298.—Can. Ent. ix. 15.—Hayd. Bul. Geo. Sur. iii. 132.
G. ASTERICOLA, Frey & Boll.—S. E. Z. xxxiv. 204.—Cin. Quar. Jour. Sci. ii. 200.
G. ATOMOSELLA, Zell.—Bei. z. Kennt. 1873, 109.
G. BOSQUELLA, Cham.—Can. Ent. viii. 33.—Hayd. Bul. Geo. Sur. iii. 132.
G. ? BEHRENSELLA, Cham.—Can. Ent. viii. 32.
G. BELFRAGEELLA, Cham.—Can. Ent. vii. 92.
G. BLANDELLA, Zell.—Tin. Nor. Amer. 257.—Proc. Ent. Soc. Phila. iii. 505; v. 145.—Can. Ent. v. 13, 47.
G. BURGESSIELLA, Zell.—Bei. z. Kennt. 1873, 107.
G. CORONIELLA, Clem.—Tin. Nor. Amer. 243.—Proc. Ent. Soc. Phila. ii. 421; v. 145.
G. 12-LINEELLA, Cham.—Can. Ent. iv. 11; ix. 124.
G. DESMODIFOLIELLA, Clem.—Tin. Nor. Amer. 268 *et seq.*—Proc. Ent. Soc. Phila. v. 145.
 (*G. violacella*, Clem.)—Proc. Acad. Nat. Sci. Phila. 1860, 7.—Tin. Nor. Amer. 93.—Cham. *in* Can. Ent. iv. 26; v. 46; Cin. Quar. Jour. Sci. i. 208.—Zell. *in* Bei. z. Kennt. 1873, 108.
(*G. elegantella*, Frey & Boll, *vid. G. packardella, post.*)
G. ERIGERONELLA, Cham.
 (*G. plantaginisella*, Cham.)—Can. Ent. iv. 10; v. 46.)
 G. geiella, MS. name—error.)—Cin. Quar. Jour. Sci. i. 200.—Can. Ent. ix. 127.
(*G. eupatoriiella*, Cham., ? = *G. venustella*, Clem. *post.*)

G. FALCONIPENNELLA, Hüb.—Bei. z. Kennt. 1873, 107.

G. FASCIELLA, Cham.

(*Aesyle fasciella*, Cham.)—Cin. Quar. Jour. Sci. ii. 97.—Can. Ent. vii. 93; ix. 123, 194.

G. FULGIDELLA, Clem.—Tin. Nor. Amer. 92.—Proc. Acad. Nat. Sci. Phila. 1860, 6.—Proc. Ent. Soc. Phila. v. 145.—Can. Ent. x. p. —.

(*G. geiella*, *vid. supra G. erigeronella.*)

(*G. inornatella*, Cham.)—Can. Ent. viii. 31; ix. 194.

G. JUGLANDISNIGRÆELLA, Cham.

(*G. juglandiella*, Cham.)—Can. Ent. iv. 28, 88; v. 15, 47.

G. LESPEDEZÆFOLIELLA, Clem.

(*Parectopa lespedezæfoliella*, Clem.)—Tin. Nor. Amer. 144.—Proc. Acad. Nat. Sci. Phila. 1860, 210.—Cham. *in* Can. Ent. iv. 7; v. 47; viii. 19; Hayd. Bul. Geo. Sur. iii. 132.

(*G. mirabilis*, Zell. = *G. robiniella*, Clem. *post.*)

G. NEGUNDELLA, Cham.—Can. Ent. viii. 18.—Hayd. Bul. Geo. Sur. iii. 132.

G. PACKARDELLA, Cham.—Can. Ent. iv. 27; ix. 194.—Cin. Quar. Jour. Sci. i. 200.

(*G. elegantella*, Frey & Boll.)—S. E. Z. xxxiv. 3.—Cin. Quar. Jour. Sci. ii. 227.

(*G. plantaginisella*, *vid. G. erigeronella.*)

G. POPULIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 301.—Hayd. Bul. Geo. Sur. iii. 13.

G. PULCHELLA, Cham.—Can. Ent. vii. 146.

G. PURPURIELLA, Cham.—Can. Ent. iv. 27; v. 46; ix. 126, 194.

G. RHOIFOLIELLA, Cham.—Can. Ent. viii. 31.

G. RIBESELLA, Cham.—Hayd. Bul. Geo. Sur. i. 132.

G. ROBINIELLA, Clem.—Can. Ent. iii. 87; iv. 7; v. 47; viii. 33.—Hayd. Bul. Geo. Sur. iii. 132.

(*Parectopa robiniella*, Clem.)—Tin. Nor. Amer. 207.—Proc. Ent. Soc. Phila. ii. 4.

(*Lithocolletis gemmea?*, Frey & Boll.)—S. E. Z. xxxiv. 218.—Cin. Quar. Jour. Sci. i. 206, 339; ii. 227.

G. SALICIFOLIELLA, Cham.—Can. Ent. iv. 25; v. 15, 46, 186.—Cin. Quar. Jour. Sci. i. 340.

G. SAUZALITOELLA, Cham.—Can. Ent. viii. 32.

G. SASSAFRASELLA, Cham.—Can. Ent. viii. 33.

G. STRIGIFINITELLA, Clem.—Tin. Nor. Amer. 92.—Proc. Acad. Nat. Sci. Phila. 1860, 6.—Proc. Ent. Soc. Phila. v. 145.

G. SUPERBIFRONTELLA, Clem.—Tin. Nor. Amer. 91.—Proc. Acad. Nat. Sci. Phila. 1861, 5.—Proc. Ent. Soc. Phila. v. 145.—S. E. Z. xxxiv. 1.—Cin. Quar. Jour. Sci. i. 200; ii. 226.

G. THERMOPSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 300.—Hayd. Bul. Geo. Sur. iii. 132.

G. VENUSTELLA, Clem.—Tin. Nor. Amer. 92, 216.—Proc. Acad. Nat. Sci. Phila. 1860, 6.—Proc. Ent. Soc. Phila. ii. 10; v. 145.
(*G. eupatoriiella*, Cham.)—Can. Ent. iv. 9; v. 44, 46.
(*G. violacella*, Clem. *vid. G. desmodifoliella*, Clem.)

(HAGNO. Chambers.)

(*H. cryptolechiæella* Cham. and *H. faginella* Cham. referred to *Cryptolechia.*)

HAMADRYAS. Clemens.

H. BASSETTELLA, Clem.—Tin. Nor. Amer. 246.—Proc. Ent. Soc. Phila. ii. 423.—Can. Ent. vi. 231; x. p. —.—Cin. Quar. Jour. Sci. ii. 115.

HARPALYCE. Cham. (*non* Steph.).

H. ALBELLA, Cham.—Can. Ent. vi. 235.
H. CANUSELLA, Cham.—Can. Ent. vi. 235.
H. TORTRICELLA, Cham.—Can. Ent. vi. 235.—Hayd. Bul. Geo. Sur. iii. 122, 141.

(HERIBEIA.)

(*H. incertella*, Cham. *vid. Argiope dorsimaculella.*)

(HELICE. Chambers.)

(*H. pallidochrella*, Cham. *vid. Gelechia gleditschiæella*, Cham.)

HELIOZELLA. (Her.-Sch.)

H. ÆSELLA, Cham.—Can. Ent. ix. 108.
H. GRACILIS, Zell.—Bei. z. Kennt. 1873, 114.

(HOMOSETIA. Clemens.)

(*H. tricingulatella*, Clem. *vid. Tinea tricingulatella.*)
(*H. costisignella*, Clem. *vid. Tinea costisignella.*)

HYALE. Chambers.

H. CORYLIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 242 (?= *Menestra tortriciformella* Clem.)

HYBROMA. Clemens.

H. SERVULELLA, Clem.—Tin. Nor. Amer. 187.—Proc. Ent. Soc. Phila. i. 137.

HYPONOMEUTA. (Zeller.)

H. APICIPUNCTELLA, Cham.—Can. Ent. vii. 8.
H. EVONYMELLA, Cham.
(*H. orbimaculella*, Cham.)—Can. Ent. iv. 42; v. 12.

H. **LONGIMACULELLA**, Cham.—Can. Ent. iv. 43.

H. **MULTIPUNCTELLUS**, Clem.—Tin. Nor. Amer. 95.—Proc. Acad. Nat. Sci. Phila. 1860, 8.—Can. Ent. iv. 42.—Guide, 348 (as *millepunctellus*).—Bei. z. Kennt. 1873, 28.

H. **QUINQUEPUNCTELLA**, Cham.—Can. Ent. vii. 7.

H. **WAKARUSA**, Gaumer.—Observer of Nature, p. — (? = *evonymella*).

H. **ZELLERIELLA**, Cham.—*Ante*, 80.

HYPATIMA.

H. **SUBSENSELLA**, Zell.—Bei. z. Kennt. 1873, 102.

H. **CONFECTELLA**, Zell.—Bei. z. Kennt. 1873, 103.

INCURVARIA.

I. **ACERIFOLIELLA**, Fitch.—Tin. Nor. Amer. 90.—Proc. Acad. Nat. Sci. Phila. 1860, 5.

(*Ornix acerifoliella*, Fitch.)—Rep. Nox. Ins. pts. 1 and 2, 269.—Ont. Rep. 1873, 42.

I. **IRIDELLA**, Cham.

(*Tinea iridella*, Cham.)—Can. Ent. v. 86.

I. **LABRADORELLA**, Clem.—Tin. Nor. Amer. 238.—Proc. Ent. Soc. Phila. ii. 416.

I. **MEDIOSTRIALELLA**, Clem.—Tin. Nor. Amer. 273.—Proc. Ent. Soc. Phila. v. 147.

(*Tinea auristrigella*, Cham.)—Can. Ent. v. 86; ix. 207.

I. **RUSSATELLA**, Clem.—Tin. Nor. Amer. 89.—Proc. Acad. Nat. Sci. Phila. 1860, 5.

(ITHOME. Chambers.) = (PERIMEDE. Chambers.)

(*I. unomaculella*, Cham. = *Perimede unomaculella*, Cham., and referred to *Laverna*, *q. v.*)

LAVERNA.

L.? **ALBELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 295.

(*L. albocapitella*, Cham. = *L. murtfeldtella*, Cham.)

L. **ALBOPALPELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 295.

L. **BIFASCIELLA**, Cham.—Can. Ent. viii. 158.

L. **CEPHALANTHIELLA**, Cham.—Can. Ent. iii. 221; vii. 53; x. p. —.

L. **CIRCUMSCRIPTELLA**, Zell.—Bei. z. Kennt. 1873, 112.—Can. Ent. x. p. —.

L.? **COLORADOELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 136.

L. **DEFINITELLA**, Zell.—Bei. z. Kennt. 1873, 111.

(*L. unicristatella*, Cham.)—Can. Ent. vii. 32; ix. 74.

L. **ELOISELLA**, Clem.—Tin. Nor. Amer. 131.—Proc. Acad. Nat. Sci. Phila. 1860, 171.—Can. Ent. ix. 74.

L.? **ERRANSELLA**, Cham.

(*Perimede erransella*, Cham.)—Can. Ent. vi. 52; vii. 52; ix. 147; x. p. —.

(*L.*? *fuscocristatella*, Cham. *vid.* *Næra fuscocristatella*, Cham.)

L.? IGNOBILISELLA, Cham.—Can. Ent. vii. 33, 51; x. p. —.

L.? GLEDITSCHIÆELLA, Cham.—Can. Ent. viii. 135, 171; x. p. 232.

L. GRANDISELLA, Cham.—Cin. Quar. Jour. Sci. ii. 296.—Hayd. Bul. Geo. Sur. iii. 144.

(*L. grisseella*, Cham. *vid.* *L. murtfeldtella.*)

L. LUCIFERELLA, Clem.—Tin. Nor. Amer. 130.—Proc. Acad. Nat. Sci. Phila. 1860, 171.

L.? MAGNATELLA.—Can. Ent. ix. 73.

(*L.? œnotheræella*, Cham.)—Can. Ent. vii. 30.

(*Phyllocnistis magnatella*, Zell.)—Bei. z. Kennt. 1873, 115.

L. MISCECOLORELLA, Cham.—Can. Ent. vii. 51.—Hayd. Bul. Geo. Sur. iii. 144.

L. MURTFELDTELLA, Cham.—Cin. Quar. Jour. Sci. ii. 237; viii. 159; ix. 13; x. p. —.

(*L. albocapitella*, Cham.)—Can. Ent. vii. 33.—Hayd. Bul. Geo. Sur. iii. 144.

(*L. grisseella*, Cham.)—Cin. Quar. Jour. Sci. ii. 295.—Hayd. Bul. Geo. Sur. iii. 141.

L.? OBSCURUSELLA, Cham.—Can. Ent. vii. 53; x. p. —.

L. ŒNOTHERÆSEMINELLA, Cham.—Can. Ent. viii. 138; x. p. —.

L.? PARVICRISTATELLA, Cham.—Can. Ent. vii. 34.

L. RUFOCRISTATELLA, Cham.—Can. Ent. vii. 33.

(*L. unicristatella*, Cham. *vid.* *L. definitella*, Zell.)

L. UNIFASCIELLA, Cham.—Can. Ent. viii. 159 (var.? *murtfeldtella*).

LEUCANTHIZA. (Clemens.)

L. AMPHICARPEÆFOLIELLA, Clem.—Tin. Nor. Amer. 85, 87–88.—Proc. Acad. Nat. Sci. Phila. 1859, 328.—Can. Ent. iii. 162; x. p. —.

(*L. saundersella*, Cham.)—Can. Ent. iii. 205.

(*L. ornatella*, Cham. *vid.* *Lithocolletis ornatella*, Cham.)

LEUCOPHRYNE. (Chambers.)

(Perhaps this might be included in *Laverna.*)

L. TRICRISTATELLA, Cham.—Can. Ent. vii. 211.

LITHARIAPTERYX. (Chambers.)

L. ABRONIÆELLA, Cham.—Can. Ent. viii. 217.—Hayd. Bul. Geo. Sur. iii. 124, 149.

(LITA.)

(*L. ternariella* and *L. liturosella* referred to *Gelechia.*)

LITHOCOLLETIS.* (Zeller.)

L. ACERIELLA, Clem.—Tin. Nor. Amer. 65, 75.—Proc. Acad. Nat. Sci. 1859, 319, 323.—Can. Ent. iii. 130.

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* *Vid.* Psyche, January, 1878.

L. **ÆNIGMATELLA**, Frey & Boll.—S. E. C. xxxiv. 219.—Cin. Quar. Jour. Sci. i. 206.

L. **ÆRIFERELLA**, Clem.—Tin. Nor. Amer. 64, 68.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 320.—Can. Ent. iii. 183.—Cin. Quar. Jour. Sci. ii. 104.

(*L. æsculisella*, Cham. var. *guttifinitella*.—Can. Ent. iii. 111.)

L. **ALBANOTELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 101.

L. **ALNIELLA?**, Zell.—S. E. Z. xxxiv. 210.—Cin. Quar. Jour. Sci. i. 201; ii. 229.—Nat. Hist. Tin. v. 211.

(*L. mariæella*, Cham.)—Can. Ent. iv. 99.

L. **ALNIVORELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 302 —Hayd. Bul. Geo. Sur. iii. 139.

L. **AMBROSIÆELLA**, Cham.—Can. Ent. iii. 127, 183.—Cin. Quar. Jour. Sci. i. 205; ii. 230.

L. **AMORPHÆELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 132, 137.

L. **AMPHICARPEÆELLA**, Cham.—Hayd. Bul. Geo. Sur. iii. 132, 137.

L. **ALTERNATA**, Zell.—Bei. z. Kennt. 1875, 145.

L. **ARGENTIFIMBRIELLA**, Clem.—Tin. Nor. Amer. 39, 64, 70.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 321.—Can. Ent. iii. 57, 85, 182.—Frey & Boll *in* S. E. Z. xxxiv. 209.—Cin. Quar. Jour. Sci. i. 201, 204; ii. 229.

L. **ARGENTINOTELLA**, Clem.—Tin. Nor. Amer. 66, 78.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 321.—Can. Ent. iii. 148; x. p. —.—Frey & Boll *in* S. E. Z. xxxiv. 214.—Cin. Quar. Jour. Sci. i. 202 *et seq.*; ii. 101.

L. **ATOMARIELLA**, Zell.—Bei. z. Kennt. 1875, 144.

L. **AURONITENS**, Frey & Boll.—S. E. Z. xxxiv. 216.

L. **AUSTRALISELLA**, Cham.—*Ante*, 103.

L. **BASISTRIGELLA**, Clem.—Tin. Nor. Amer. 39, 65, 66, 69.—Proc. Acad. Nat. Sci. 1859, 319, 321.—Can. Ent. iii. 148, 149, 166, 182.—Cin. Quar. Jour. Sci. i. 205.

L. **BETHUNEELLA**, Cham.—Can. Ent. iii. 109.—Cin. Quar. Jour. Sci. ii. 103.—Can. Ent. x. p. —.

L. **BICOLORELLA**, Cham.—*Ante*, 103.

L. **BIFASCIELLA**, Cham.—*Ante*, 101.

L. **BOSTONICA**, Frey & Boll.—S. E. Z. xxxiv. 216.—Cin. Quar. Jour. Sci. i. 206; ii. 230.

L. **CARYÆALBELLA**, Cham.—Can. Ent. iii. 58, 85, 182, 206.

L. **CARYÆFOLIELLA**, Clem.—Tin. Nor. Amer. 65, 74.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 323.—Can. Ent. iii. 109, 165.

L. **CASTANEÆELLA**, Cham.—Cin. Quar. Jour. Sci. 109, 165.

L. **CELTIFOLIELLA**, Cham.—Can. Ent. iii. 128; x. p. —.

L. **CELTISELLA**, Cham.—Can. Ent. iii. 129.—Cin. Quar. Jour. Sci. i. 201; x. p. —.

L. **CINCINNATIELLA**, Cham.—Can. Ent. iii. 144, 149.—Cin. Quar. Jour. Sci. i. 149.—*Ante*, p. —.—Hayd. Bul. Geo. iii. 141.

L. CONGLOMERATELLA, Zell.—Bei. z. Kennt. 1875, 140.

L. CONSIMILELLA, Frey & Boll.—S. E. Z. xxxiv. 214.—Cin. Quar. Jour. Sci. i. 202.

L. CORYLIELLA, Cham.—Can. Ent. iii. 111, 127; x. p. —.

L. CRATÆGELLA, Clem.—Tin. Nor. Amer. 66, 77, 141.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 324; 1860, 208.—Can. Ent. iii. 55, 108, 166; v. 50; vi. 150.—*Ante*, p. —.—Cin. Quar. Jour. Sci. i. 206, 201.

L. CURVILINEATELLA, Pack.—Guide, 354.—Can. Ent. iii. 183. (Not a *Lithocolletis* ?)

L. DESMODIELLA, Clem.—Tin. Nor. Amer. 65, 68.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 220.—Can. Ent. i. 127, 152.

L. FITCHELLA, Clem.—Tin. Nor. Amer. 139.—Proc. Acad. Nat. Sci. Phila. 1860, 207.—Can. Ent. iii. 183.—Cin. Quar. Jour. Sci. i. 201.—Guide, 353.—Hayd. Bul. Geo. Sur. iii. 139.—Can. Ent. x. p. —.

Argyromiges quercifoliella, Fitch.—Rep. 5, sec. 327.

L. FUSCOCOSTELLA, Cham.—Cin. Quar. Jour. Sci. ii. 102.

L. GEMINATELLA, Pack.—Guide, 353.—Can. Ent. iii. 183. (Not a *Lithocolletis* ?)

L. GEMMEA, Frey & Boll.—S. E. Z. xxxiv. 218.—Cin. Quar. Jour. Sci. i. 206 *et seq*. 339; ii. 227.

L. GUTTIFINITELLA, Clem.—Tin. Nor. Amer. 65, 76.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 324.—Can. Ent. iii. 110 *et seq.*—Cin. Quar. Jour. Sci. i. 201 *et seq* —*Ante*, 102.

L. HAGENI, Frey & Boll.—S. E. Z. xxxiv. 208.—Cin. Quar. Jour. Sci. i. 201 *et seq.*—*Ante*, 100.

L. HAMADRYADELLA, Clem.—Tin. Nor. Amer. 65, 77.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 324 —Can. Ent. iii. 55, 164, 182.—Cin. Quar. Jour. Sci. ii. 201 *et seq.*

L. HELEANITHIVORELLA, Cham.—Cin. Quar. Jour. Sci. ii. 100, 230.

L. NIDIFICANSELLA, Pack.—Guide, 354.—Can. Ent. iii. 184. (? A *Lyonetia.*)

L. IGNOTA, Frey & Boll.—S. E. Z. xxxiv. 215 —Cin. Quar. Jour. Sci. i. 205; ii. 230.

L. INTERMEDIA, Frey & Boll.—S. E. Z. xxxiv. 210.—Cin. Quar. Jour. Sci. i. 201; ii. 230.

(*L. juglandiella*, Clem.=*L. caryæfoliella*, Clem.—Tin. Nor. Amer. 170.—Proc. Ent. Soc. Phila. i. 81.—Can. Ent. iii. 165; vii. 126; x. p. —.—Guide, 353.)

L. LONGISTRIATA, Frey & Boll.—S. E. Z. xxxiv. 209, 210.—Cin. Quar. Jour. Sci. i. 201; ii. 229.

L. LUCETIELLA, Clem.—Tin. Nor. Amer. 65, 73.—Proc. Acad. Nat. Sci. Phila. 1859, 319, 322.—Can. Ent. iii. 56.

L. LYSIMACHIÆELLA, Cham.—Cin. Quar. Jour. Sci. ii. 100.

L. **LUCIDICOSTELLA**, Clem.—Tin. Nor. Amer. 39, 64, 66.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 319.—Cin. Quar. Jour. Sci. ii. 102.—Can. Ent. iii. 57, 182. (The statement that the larva mines leaves of the Sycamore (*Platanus*) is incorrect.)

(*L. mariæella*, Cham. *vid. L. alniella*, Zell.)

L. **MIRIFICA**, Frey & Boll.—S. E. Z. xxxiv. 212.—Cin. Quar. Jour. Sci. i. 202.

L. **NECOPINUSELLA**, Cham.—*Ante*, 100.

(*L. nonfasciella*, Cham.—Can. Ent. iii. 108.—Cin. Quar. Jour. Sci. i. 201.) (This must be dropped from the list: there is no such species. It was described from varieties and old specimens of *L. celtisella* Cham.)

L. **OBSCURICOSTELLA**, Clem.—Tin. Nor. Amer. 64, 71.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 321.—Can. Ent. iii. 85; x. p. 102.

L. **OBSOLETELLA**, Frey & Boll.—S. E. Z. xxxiv. 211.—Cin. Quar. Jour. Sci. i. 202.

L. **OBSTRICTELLA**, Clem.—Tin. Nor. Amer. 64, 73.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 322.—Can. Ent. iii. 183.—*Ante* 102.

L. **ORNATELLA**, Cham.—Can. Ent. iii. 161; iv. 107; x. p. —.—Cin. Quar. Jour. Sci. i. 201 *et seq.* 339; ii. 228.—S. E. Z. xxxiv. 217.—Bei. z. Kennt. 1875, 141.

(*Leucanthiza ornatella.*)—Can. Ent. iii. 87, 127.

L. **OSTENSACKENELLA**, Fitch.

(*Argyromiges ostensackenella*, Fitch.)—Can. Ent. iii. 183.—Rep. Nox. Ins. New York, n. 5. sec. 338.

L. **OSTRYÆFOLIELLA**, Clem.—Tin. Nor. Amer. 64, 71.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 322.—Can. Ent. iii. 85.—Cin. Quar. Jour. Sci. i. 202.

(*L. ostryæella*, Cham. var. *L. coryliella*, Cham. *q. v.*)

L. **POPULIELLA**, Cham.—*Ante*, 101.

L. **QUERCIALBELLA**, Fitch.—Rep. Nox. Ins. N. Y. n. 5, sec. 328.—Can. Ent. iii. 57.

L. **QUERCIBELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 102.

(*L. quercifoliella*, Fitch, *vid. L. fitchella*, Clem.)

L. **QUERCITORUM**, Frey & Boll.—S. E. Z. xxxiv. 207.—Cin. Quar. Jour. Sci. i. 201; ii. 229.—Bei. z. Kennt. 1875, 140.—Hayd. Bul. Geo. Sur. iii. 139, 141.—Can. Ent. x. p. —.

L. **RILEYELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 236.

L. **ROBINIELLA**, Clem.—Tin. Nor. Amer. 14 *et seq.* 22, 64, 66, 208.—Proc. Acad. Nat. Sci. Phila. 1859, 318, 319; 1860, 209.—Can. Ent. iii. 54 *et seq.* 87, 163, 183, 185; iv. 9, 117.—S. E. Z. xxxiv. p. —.—Cin. Quar. Jour. Sci. vi. 203, 208, 339; ii. 228.—Bei. z. Kennt. 1875, 142.—Hayd. Bul. Geo. Sur. 132, 137.

(*Argyromiges pseudacaciella*, Fitch.)—Rep. Nox. Ins. N. Y. n. 5, sec. 335.

? *A. uhlerella*, Fitch.—*Ibid.* 337.

? *A. morrisella*, Fitch.—*Ibid.* 336.

L. SALICIFOLIELLA, Clem.—Tin. Nor. Amer. 169.—Proc. Ent. Soc. Phila. i. 81.—Can. Ent. iii. 163, 185.—Guide, 353.—Hayd. Bul. Geo. Sur. iii. 139, 141.

(*L. scudderella*, Frey & Boll.)—S. E. Z. xxxiv. 212.—Cin. Quar. Jour. Sci. ii. 202.

L. SYMPHORICARPEÆELLA, Cham.—Cin. Quar. Jour. Sci. ii. 98.

(*L. scudderella*, Frey & Boll. *vid. L. salicifoliella, supra.*)

L. TILLIÆELLA, Cham.—Can. Ent. iii. 56.—Cin. Quar. Jour. Sci. vi. 203.

L. TRIFASCIELLA, Haw.—S. E. Z. xxxiv. 215.—Cin. Quar. Jour. Sci. i. 205.—Can. Ent. x. p.—.

L. TRITÆNIAELLA, Cham.—Can. Ent. iii. 110, 184; v. 48; x. p. —.—Cin. Quar. Jour. Sci. i. 202.

L. TEXANELLA, Zell.—Bei. z. Kennt. 1875, 143.—Hayd. Bul. Geo. Sur. v. 132, 137.

L. TUBIFERELLA, Clem.—Tin. Nor. Amer. 140.—Proc. Acad. Nat. Sci. Phila. 1860, 208.—Can. Ent. iii. 165, 183.

L. ULMELLA, Cham.—Can. Ent. iii. 148.—Cin. Quar. Jour. Sci. i. 202, 204; ii. 101.—S. E. Z. xxxiv. 214.

L. UNIFASCIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 103 *et seq.*

(*L. virginiella*, Cham.—Can. Ent. iii. 84; x. p. —. = *L. ostryæfoliella*, Clem.)

LYONETIA. (Hübner.)

L. ALNIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 303.—Hayd. Bul. Geo. Sur. iii. 140.

L. APICISTRIGELLA, Cham.—Cin. Quar. Jour. Sci. ii. 105.—Can. Ent. x. p. —.

L. GRACILELLA, Cham.—Can. Ent. viii, 34; x. p. —.

L.? NIDIFICANSELLA, Pack.

(*Lithocolletis nidificansella*, Pack.)—Guide, 354.—Can. Ent. x. p. —.

(*L. saccatella*, Pack. *vid. Aspidisca splendoriferella.*)

L. SPECULELLA, Clem.—Tin. Nor. Amer. 184.—Proc. Ent. Soc. Phila. i. 134.—Can. Ent. x. p. —.

(MACHIMIA. Clemens.)

(*M. tentoriferella*, *vid. Cryptolechia tentoriferella.*)

(MALACHOTRICHA.)

(*M. bilobella*, Zell. *vid. Gelechia bilobella.*)

MARMARA. (Clemens.)

M. SALICLELLA, Clem.—Tin. Nor. Amer. 212.—Proc. Ent. Soc. Phila. ii. 7.

MENESTRA. (Clemens.)

M. **TORTRICIFORMELLA**.—Tin. Nor. Amer. 151.—Proc. Acad. Nat. Sci. Phila. 1860, 213.

MICROPTERYX.

M. **POMIVORELLA**, Pack.—Rep. Mass. Ag. Soc. 1870.—Am. Nat. vi. 685.

(MIEZA, *vid.* ENÆMIA.)

NÆRA. (Chambers.)

N. **FUSCOCRISTATELLA**, Cham.—Can. Ent. vii. 9, 51.
(*Laverna fuscocristatella*, Cham.)—Can. Ent. vii. 34.

NEDA. (Chambers.)

N. **PLUTELLA**, Cham.—Can. Ent. vi. 243; vii. 105.

NEPTICULA. (Zeller.)

N. **AMELANCHIERELLA**, Clem.—Tin. Nor. Amer. 174.—Proc. Ent. Soc. Phila. i. 84.—Guide, 356.
N. **ANGUINELLA**, Clem.—Tin. Nor. Amer. 175.—Proc. Ent. Soc. Phila. i. 85.
N. **APICIALBELLA**, Cham.—Can. Ent. v. 127.—Cin. Quar. Jour. Sci. ii. 118.
N. **BADIOCAPITELLA**, Cham.—Can. Ent. viii. 160.
N. **BELFRAGEELLA**, Cham.—Can. Ent. vii. 75.
N. **BIFASCIELLA**, Cham.—Tin. Nor. Amer. 183.—Proc. Ent. Soc. Phila. i. 133; v. 146.
N. **BOSQUEELLA**, Cham.—*Ante*, 106.
N. **CASTANEÆFOLIELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 117.
N. **CARYÆFOLIELLA**.—Tin. Nor. Amer. 174.—Proc. Ent. Soc. Phila. i. 84.
N. **CILLIÆFUSCELLA**, Cham.—Can. Ent. v. 128.—Cin. Quar. Jour. Sci. ii. 117. (= *N. fuscotibiœella* Clem.)
N. **CLEMENSELLA**, Cham.—Can. Ent. v. 125.
N. **CORYLIFOLIELLA**, Clem.—Tin. Nor. Amer. 172.—Proc. Ent. Soc. Phila. i. 83.—Guide, 356.
N. **CRATÆGIFOLIELLA**, Clem.—Tin. Nor. Amer. 173.—Proc. Ent. Soc. Phila. i. 83.
N. **FUSCOCAPITELLA**, Cham.—Can. Ent. v. 128.
N. **FUSCOTIBIÆELLA**, Clem.—Tin. Nor. Amer. 182.—Proc. Ent. Soc. Phila. i. 133; v. 146.—Can. Ent. v. 127.—Cin. Quar. Jour. Sci. ii. 114.
N. **JUGLANDIFOLIELLA**, Cham.—Tin. Nor. Amer. 173.—Proc. Ent. Soc. Phila. i. 84.—*Ante*, 105.
N. **LATIFASCIELLA**, Cham.—*Ante*, 106.

N. MAXIMELLA, Cham.—Can. Ent. v. 126.
N. MINIMELLA, Cham.—Can. Ent. v. 127.
N. NIGRIVERTICELLA, Cham.—Cin. Quar. Jour. Sci. ii. 118.
N. OCHREFASCIELLA, Cham.—Can. Ent. v. 128.
N. OSTRYÆFOLIELLA, Clem.—Tin. Nor. Amer. 172.—Proc. Ent. Soc. Phila. i. 83.
N. PLATANELLA, Clem.—Tin. Nor. Amer. 173, 183.—Proc. Ent. Soc. Phila. i. 83, 133; v. 146.—Can. Ent. v. 125.—Guide, 356.
N. PLATEA, Clem.—Tin. Nor. Amer. 175.—Proc. Ent. Soc. Phila. i. 85.
N. PRUNIFOLIELLA, Clem.—Tin. Nor. Amer. 174.—Proc. Ent. Soc. Phila. i. 84.—Can. Ent. v. 126. (? *serotinæella* or ? Dipterous.)
N. QUERCICASTANELLA, Cham.—Can. Ent. v. 127.—*Ante*, p. —.—Can. Ent. x. 105.
N. QUERCIPULCHELLA, Cham.—*Ante*, 105.
N. RESPLENDENSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 118.
N. ROSÆFOLIELLA, Clem.—Tin. Nor. Amer. 176.—Proc. Ent. Soc. Phila. i. 86.
N. RUBIFOLIELLA, Clem.—Tin. Nor. Amer. 32, 42, 45, 152.—Proc. Ent. Soc. Phila. v. 146.
N. SAGINELLA, Clem.—Tin. Nor. Amer. 175, 270.—Proc. Ent. Soc. Phila. i. 85, 144.
N. SEROTINÆELLA, Cham.—Can. Ent. v. 126; x. p. —.
N. THORACEALBELLA, Cham.—Can. Ent. v. 127.
N. UNIFASCIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 119.—*Ante*, p. —.
N. VILLOSELLA, Clem.—Tin. Nor. Amer. 174.—Proc. Ent. Soc. Phila. i. 84.
N. VIRGINIELLA, Clem.—Tin. Nor. Amer. 172.—Proc. Ent. Soc. Phila. i. 83.

(NOMIA. Clemens.)

(*N. lingualacella*, Clem. *vid. Chrysopora lingualacella.*)

NOTHRIS. (Hübner.)

N.? BIMACULELLA, Cham.—Hayd. Bul. Geo. Sur. iii. 122.
N. EUPATORIIELLA, Cham.—Can. Ent. ix. 23.
(*Ypsolophus eupatoriiella*, Cham.)—Can. Ent. iv. 221.
(*Nothris dolabella*, Zell.)—Bei. z. Kennt. 1873, 88.
N. GRISSEELLA, Cham.—Can. Ent. vi. 245.

ŒCOPHORA. (Zeller.)

Œ. ARGENTICINCTELLA, Clem.—Can. Ent. v. 188–190.—Cin. Quar. Jour. Sci. ii. 114.
(*Callima argenticinctella*, Clem.)—Tin. Nor. Amer. 12, 46, 123.—Proc. Acad. Nat. Sci. Phila. 1860, 167.
Œ. BORKHAUSENII, Zell.—Bei. z. Kennt. 1873, 90.

Œ. **BOREASELLA**, Cham.—Can. Ent. v. 189.—Cin. Quar. Jour. Sci. ii. 114, 292.—Hayd. Bul. Geo. Sur. iii. 129, 141.

(*Œ. bosquella*, Cham. *vid. Gelechia bosquella.*)

(*Œ. constrictella*, Zell. *vid. Theisoa constrictella.*)

Œ. **DETERMINATELLA**, Zell.—Bei. z. Kennt. 1873, 89.

(*Œ. australisella*, Cham.)—Can. Ent. vii. 124; ix. 23.—Cin. Quar. Jour. Sci. ii. 114.

(*Œ. granella*, Lat. *vid. Gelechia granella.*)

Œ. 4-**MACULELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 292.—Hayd. Bul. Geo. Sur. iii. 129.

Œ. **SHALERIELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 114.

ŒNOE. (Chambers.)

Œ. **HYBROMELLA**, Cham.—Can. Ent. vi. 50.

ŒSEIS. (Chambers.)

Œ. **BIANULELLA**. Cham.—Cin. Quar. Jour. Sci. ii. 255.

ŒTA. (Grote.)

Œ. **PUNCTELLA**, Cra.—Bei. z. Kennt. 1873, 28.

(*Pœciloptera compta*, Clem.)—Proc. Acad. Nat. Sci. 1860, 546.

(*Œta compta*, Grote.)—Proc. Ent. Soc. Phila. v. 230.—Riley's Rep. Nox. Ins. Mo. 1869, 151.—Zell. Ent. Zeit. 1871, s. 178.

(*Tinea pustulella*, Fab.)—Ent. Syst. iii. pt. ii. 292.

(*Phalena punctella*, Cramer.—Ins. 31.)

OPOSTEGA. (Zeller.)

O. **ALBOGALLERIELLA**, Clem.—Tin. Nor. Amer. 180.—Proc. Ent. Soc. Phila. i. 131.

O. 4-**STRIGELLA**, Cham.—Cin. Quar. Jour. Sci. ii. 106.

ORNIX. (Zeller.)

(*O. acerifoliella*, Fitch, *vid. Incurvaria acerifoliella.*)

O. **BOREASELLA**, Clem.—Tin. Nor. Amer. 237.—Proc. Ent. Soc. Phila. ii. 415.

O. **CRATÆGIFOLIELLA**, Clem.—Tin. Nor. Amer. 94.—Proc. Acad. Nat. Sci. Phila. 1860, 8.—Can. Ent. v. 48.

O. **FESTINELLA**, Clem.—Tin. Nor. Amer. 94.—Proc. Acad. Nat. Sci. Phila. 1860, 97.

O. **INUSITATUMELLA**, Cham.—Can. Ent. v. 47; viii. 19.

O. **PRUNIVORELLA**, Cham.—Can. Ent. v. 50.—Cin. Quar. Jour. Sci. ii. 301.—Hayd. Bul. Geo. Sur. iii. 133, 141.

O. **QUADRIPUNCTELLA**, Clem.—Tin. Nor. Amer. 177.—Proc. Ent. Soc. Phila. i. 86.

O. QUERCIFOLIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 116.
O. TREPIDELLA, Clem.—Tin. Nor. Amer. 94.—Proc. Acad. Nat. Sci. Phila. 1860, 7.

PARASIA. (Dup.)

(*P. apicistrigella*, Cham. *vid. Gelechia apicistrigella.*)
(*P. apicipunctella*, *vid. Evagora apicipunctella.*)
(*P. grisseella*, Cham. *vid. Gelechia grisseella.*)
P. SUBSIMELLA, Clem.—Tin. Nor. Amer. 137.—Proc. Acad. Nat. Sci. Phila. 1860, 173.

(PARECTOPA. Clemens.)

(*P. lespedezæfoliella et robiniella*, Clem. *vid. sub Gracilaria.*)

PHAETUSA. (Chambers.)

P. PLUTELLA, Cham.—Can. Ent. vii. 105; x. p. —.

(PERIMEDE. Chambers.)

(*P. erransella et P.* (*Ithome*) *unomaculella*, Cham. *vid. sub Laverna.*)

PHIGALIA. (Chambers.)

P. ALBELLA, Cham.—Can. Ent. vii. 107.
P. OCHREMACULELLA, Cham.—*Ibid.*

PHILONOME. (Chambers.)

P. CLEMENSELLA, Cham.—Can. Ent. vi. 97; viii. 136; ix. 13; x. p. —.

PHYLLOCNISTIS. (Zeller.)

P. AMPELOPSIELLA, Cham.—Can. Ent. iii. 207 (206 erroneously *ampelopsifoliella*).—Cin. Quar. Jour. Sci. ii. 107, 303.—Hayd. Bul. Geo. Sur. iii. 140, 141.
P. ERECHTITISELLA, Cham.—*Ante*, 104.
P. LIRIODENDRONELLA, Clem.—Tin. Nor. Amer. 220.—Proc. Ent. Soc. Phila. ii. 13.—Can. Ent. iii. 185, 206, 207.
P. LIQUIDAMBARISELLA, Cham.—Cin. Quar. Jour. Sci. ii. 106.
(*P. magnatella*, Zell. *vid. Laverna? magnatella.*)
P. POPULIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 106, 303.—Can. Ent. viii. 19.—Hayd. Bul. Geo. Sur. iii. 140, 141, 147.
P. SMILACICELLA, Cham.—Cin. Quar. Jour. Sci. ii. 107.
P. VITIGENELLA, Clem.—Tin. Nor. Amer. 22, 23, 39, 83.—Proc. Acad. Nat. Sci. Phila. 1859, 327.—Can. Ent. iii. 206; vi. 169.
P. VITIFOLIELLA, Cham.—Can. Ent. iii. 206 *et seq.*; vi. 169.

PIGRITIA. (Clemens.)

P. LATICAPITELLA, Clem.—Tin. Nor. Amer. 41, 136.—Proc. Acad. Nat. Sci. Phila. 1860, 173.

P. OCHRELLA, Clem.—Tin. Nor. Amer. 232.—Proc. Ent. Soc. Phila. ii. 126.

P. OCHROCOMELLA, Clem.—Tin. Nor. Amer. 232.—Proc. Ent. Soc. Phila. ii. 126.

PITYS. (Chambers.)

P. AURICRISTATELLA, Cham.—Can. Ent. v. 110; ix. 207.

P. FASCIELLA, Cham.—*Ibid.;* ix. 207.

P. FUSCOCRISTATELLA, Cham.—*Ibid.*

P. MISCECRISTATELLA, Cham.—*Ibid.*

PLUTELLA. (Schr.)

P. CRUCIFERARUM, Zell.—Tin. Nor. Amer. 39, 90.—Proc. Acad. Nat. Sci. Phila. 1860, 6.—Can. Ent. viii. 119; vi. 230, 232.—Bei. z. Kennt. 1873, 33.—Rep. Bost. Ag. Soc. ii. 11.—Hayd. Bul. Geo. Sur. iii. 122, 141, 144, 147.

(*P. limbipennella*, Clem.)—*Ibid.*

(*Cerostoma brassicella*, Fitch.)—*Ibid.* and Rep. Nox. Ins. N. Y. i. 170–5.—Ag. Rep. 1871, 82.

(*P. zylostella.*)—Rep. Mass. Ag. Soc. ii. 11.

(*P. mollipedella*, Clem. *loc. cit. sup.*, *? = cruciferarum.*)

P. PORRECTELLA, Linn. *loc. cit. sup.* (*vigilaciella*, Clem.).

(PŒCILIA.)

(*P. bifasciella*, Clem., *basistrigella*, Clem., and *fragmentella*, *vid. Gelechia.*)

(PŒCILOPTERYX. Clemens.)

(*P. compta*, *vid. Œta punctella.*)

POLYHYMNO. (Chambers.)

(*P. fuscostrigella*, Cham.—Can. Ent. viii. 30. *= luteostrigella.*)

P. LUTEOSTRIGELLA, Cham.—*Loc. cit. sup.* and Can. Ent. vi. 247.

P. 6-STRIGELLA, Cham.—Can. Ent. vi. 248.

PRONUBA. (Riley.)

P. YUCCASELLA, Riley.—Proc. Acad. Sci. Mo. iii. 55, 333.—Rep. Nox. Ins. Mo. v. 151; vi. 131.—Can. Ent. iv. 182.—Hayd. Bul. Geo. Sur. iii. 121, 141.

(*Tegeticula alba*, Zell.)—Bei. z. Kennt. 1873, 32; 1875, 139.

PSECADIA. (Hübner.)

P. SEMILUGENS, Zell.—Bei. z. Kennt. 1872, 115.—Cin. Quar. Jour. Sci. ii. 258.—Can. Ent. vi. 233. (As *Anesychia multipunctella*, Cham.)

(PSILOCORSIS. Clemens.)

(*P. querciella*, Clem. and *P. reflexa*, Clem. *vid. sub Cryptolechia.*)

(RHINOSIA.)

(*R. pometellus*, Harris, *vid. Ypsolophus pometellus.*)

SAGARITIS. (Chambers.)

S. GRACILELLA, Cham.—Can. Ent. iv. 226; vi. 245.

SEMELE. (Chambers.)

S. ARGENTISTRIGELLA, Cham.—Can. Ent. viii. 105.
(*Tinea argentistrigella*, Cham.)—Can. Ent. v. 89.
S. ARGENTINOTELLA, Cham.—Can. Ent. viii. 104.
(*S. bifasciella*, Cham. MS. name inadvertently used = *cristatella.*)—Can. Ent. viii. 105; ix. 208.
S. CRISTATELLA, Cham.—Cin. Quar. Jour. Sci. ii. 243.—Can. Ent. ix. 208.

SETOMORPHA. (Zeller.)

S. OPEROSELLA, Zell.—Bei. z. Kennt. 1873, 23.
S. INAMŒNELLA, Zell.—Bei. z. Kennt. 1873, 23.
S. RUDERELLA, Zell.—Bei. z. Kennt. 1873, 23.

(SINOE. Chambers.)

(*S. fuscopallidella*, Cham. *vid. Gelechia.*)

SOLENOBIA. (Zeller.)

S. WALSHELLA, Clem.—Tin. Nor. Amer. 181.—Proc. Ent. Soc. Phila. i. 132.—Guide, 346.—Can. Ent. v. 74; vii. 125; viii. 19.

STILBOSIS. (Clemens.)

S. TESQUATELLA, Clem.—Tin. Nor. Amer. 40, 129.—Proc. Acad. Nat. Sci. Phila. 1860, 170.

STROBISIA. (Clemens.)

S. ALBACILIAELLA, Cham.—Can. Ent. x. p. —.
S. ARGENTICILIÆELLA, Cham.—Can. Ent. x. p. —.
S. EMBLEMELLA, Clem.—Tin. Nor. Amer. 40, 118.—Proc. Acad. Nat. Sci. Phila. 1860, 164.
(*S. venustella*, Cham.)—Can. Ent. iv. 90.
S. IRIPENNELLA, Clem.—*Loc. cit. sup.*
(*S. aphroditeella*, Cham.)—Can. Ent. iv. 88.
S. LEVIPEDELLA, Clem.—Tin. Nor. Amer. 207.—Proc. Ent. Soc. Phila. ii. 4.

(TACHIPTILIA.)

(*T. consonella et inocuella, vid. Gelechia.*)

(TELEIA.)

T. sequax, scopella, et dorsivittella, Zell., *vid. Gelechia.*)

(TEGETICULA.)

(*T. alba,* Zell. *vid. Pronuba yuccasella.*)

TENAGA. (Clemens.)

T. POMILIELLA, Clem.—Tin. Nor. Amer. 184.—Proc. Ent. Soc. Phila. i. 136.

(TELPHUSA.)

(*T. curvistrigella,* Cham. = *Gelechia longifasciella,* Clem.)

TINEA. (Haw.)

T. ACAPNOPENNELLA, Clem.—Tin. Nor. Amer. 233.—Proc. Acad. Nat. Sci. Phila. 1859, 257.
T. APICIMACULELLA, Cham.—Cin. Quar. Jour. Sci. ii. 257.
T. AUROPULVELLA, Cham.—Can. Ent. v. 90; vii. 125; viii. 19.
(*T. auristrigella,* Cham. = *Incurvaria mediostriatella,* Clem.)
T. AUROSUFFUSELLA, Cham.—Can. Ent. v. 87.
T. BEHRENSELLA, Cham.—Cin. Quar. Jour. Sci. ii. 249.
(*T. biflavimaculella,* Clem. *vid. T. rustacella.*)
T. BIMACULELLA, Cham.—Can. Ent. v. 87.
T. BISELIELLA, Hum.—Ins. Brit. iii. 34, and authorities there cited.—Bei. z. Kennt. 1873, 23.
(*T. lanariella,* Clem.)—Tin. Nor. Amer. 39, 50, 52, 60.—Proc. Acad. Nat. Sci. Phila. 1859, 251, 258. *Vid. post, crinella, flavifrontella,* and *lanariella.*
(*T. carnariella,* Clem. = *T. pellionella.*)
T. CŒMETARIÆELLA, Cham.—Can. Ent. v. 85; viii. 105.
T. (HOMOSETIA) COSTOSIGNELLA, Clem.—Tin. Nor. Amer. 235.—Proc. Ent. Soc. Phila. ii. 128.
T. COSTOSTRIGELLA, Cham.—Can. Ent. v. 87.
(*T. crinella, vid. biseliella* and Treat. Ins. 493.)
T. CROCICAPITELLA, Clem.—Tin. Nor. Amer. 49, 51, 60.—Proc. Acad. Nat. Sci. Phila. 1859, 257 *et seq.*
T. CROCEOVERTICELLA, Cham.—Can. Ent. viii. 106.
T. DEFECTELLA, Zell.—Bei. z. Kennt. 1873, 20.
T. (BLABOPHANES) DORSISTRIGELLA, Clem.—Tin. Nor. Amer. 38, 49, 50.—Proc. Acad. Nat. Sci. Phila. 1859, 257 *et seq.*—Bei. z. Kennt. 1873, 20; 1875, 136.

(*T. flavifrontella*, Linn.—Guide, 346.—Treat. Ins. 494.—Ont. Rep. 1873, 27.—Am. Nat. i. 422, *biseliella*.—Ag. Rep. 1864, 556.)

T. FUSCIPUNCTELLA, Haw.—Ins. Brit. 33, and authorities there cited.—Bei. z. Kennt. 1873, 22.

(*T. nubilipennella*, Clem.)—Tin. Nor. Amer. 39, 50, 52.—Proc. Acad. Nat. Sci. 1859, 257, 259.

T. FUSCOMACULELLA, Cham.—Can. Ent. v. 88.

T. FUSCOPULVELLA, Cham.—Can. Ent. v. 90.

T. GRANELLA.—Guide, 347.—Treat. Ins. 496.—Ag. Rep. 1854, 65; 1855, 98; 1864, 556. (*? variatella*, Clem.)

T. GRISSEELLA, Cham.—Can. Ent. v. 88.

T. GRUMELLA, Zell.—Bei. z. Kennt. 1873, 21.

(*T. hordei* = *T. cerealella* = *Gelechia cerealella*.)

T. IMITATORELLA, Cham.—Can. Ent. viii. 105.

(*T. iridella*, Cham. *vid. Incurvaria iridella*.)

(*T. lanariella*, Clem. = *biseliella*.)

T. MACULABELLA, Cham.—Can. Ent. v. 90.

T. MACULIMARGINELLA, Cham.—Can. Ent. vii. 212.

T. MARGINISTRIGELLA, Cham.—Can. Ent. v. 88.

T. MARMORELLA, Cham.—Can. Ent. vii. 212.

T. MINUTIPULVELLA, Cham.—Can. Ent. vii. 212.

T. MISELLA, Zell.—Bei. z. Kennt. 1873, 23.

T. MISCEELLA, Cham.—Can. Ent. v. 86.

T. NIVEOCAPITELLA, Cham.—Cin. Quar. Jour. Sci. ii. 249.

(*T. nubilipennella*, Clem. =*fuscipunctella*.)

T. OBSCUROSTRIGELLA, Cham.—Can. Ent. vi. 232.

T. ORLEANSELLA, Cham.—Can. Ent. v. 85.

T. PELLIONELLA, Lin.—Ins. Brit. 32.—Tin. Nor. Amer. 49, 51.—Proc. Acad. Nat. Sci. Phila. 1859, 256, 257 (as *carnariella*, Clem.).

(*T. pustulella*, *vid. Œta pustulella*.)

T. STRAMINIELLA, Cham.—Can. Ent. v. 86.

T. 7-STRIGELLA, Cham.—*Ante*, p. —.

T. TAPETZELLA, Lin.—Ins. Brit. iii. 28.—Tin. Nor. Amer. 258.—Proc. Ent. Soc. Phila. iii. 505.—Can. Ent. vii. 124.—Rep. Nox. Ins. Mo. iii. 10.—Guide, 347.—Amer. Ent. and Bot. i. 90.

T. THORACESTRIGELLA, Cham.—Can. Ent. viii. 106.

T. (HOMOSETIA) TRICINGULATELLA, Clem.—Tin. Nor. Amer. 234.—Proc. Ent. Soc. Phila. ii. 128.

T. TRIMACULELLA, Cham.—Can. Ent. v. 88.

T. UNOMACULELLA, Cham.—Cin. Quar. Jour. Sci. ii. 258.

(*T. vestianella*, *vid. rusticella*.)

T. RUSTICELLA, Hüb.—Ins. Brit. iii. 27.

(*T. biflavimaculella*, Clem.)—Tin. Nor. Amer. 38, 49, 50, 237.—Proc. Acad. Nat. Sci. Phila. 1859, 257.—Proc. Ent. Soc. Phila. ii. 413.—Bei. z. Kennt. 1873, 20.

(*T. vestianella*.)—Rep. Nox. Ins. Mo. iii. 10.—Amer. Ent. and Bot. i. 90.

T. VARIATELLA, Clem., ?= *granella*.—Tin. Nor. Amer. 50, 53.—Proc. Acad. Nat. Sci. Phila. 1859, 257, 259.—Can. Ent. vii. 125.

T. ZEÆ, Fitch.—Rep. Nox. Ins. N. Y. i. 320.

THEISOA. (Chambers.)

T. CONSTRICTELLA.

(*Œcophora constrictella*, Zell.)—Bei. z. Kennt. 1873, 91.

(*Theisoa bifasciella*, Cham.)—Can. Ent. vi. 75; vii. 93; ix. 24.

T. MULTIFASCIELLA, Cham.—Can. Ent. vi. 75; vii. 93.

TISCHERIA. (Zeller.)

T. ÆNIA, Frey & Boll.—S. E. Z. xxxiv. 222.—Cin. Quar. Jour. Sci. i. 210.—*Ante*, 99.

T. AMBROSIÆELLA, Cham.—Cin. Quar. Jour. Sci. ii. 112, 238.

T. BADIIELLA, Cham.—Can. Ent. vii. 124.—Cin. Quar. Jour. Sci. ii. 109, 111.

T. CASTANEÆELLA, Cham.—Cin. Quar. Jour. Sci. ii. 111.

T. CITRINIPENELLA, Clem.—Tin. Nor. Amer. 39, 80, 82.—Proc. Acad. Nat. Sci. Phila. 1859, 324.—Can Ent. iii. 208.

T. COMPLANOIDES, Frey & Boll., ?= *zelleriella*, Clem.—S. E. Z. xxxiv. 220.—*Ante*, 99.

T. CONCOLOR, Zell.—Bei. z. Kennt. 1875, 146.

T. FUSCOMARGINELLA, Cham.—Cin. Quar. Jour. Sci. ii. 110.

T. HELIOPSISELLA, Cham.—Cin. Quar. Jour. Sci. ii. 113, 238.

T. LATIPENNELLA, Cham.—*Ante*, 97.

T. MALIFOLIELLA, Clem.—Tin. Nor. Amer. 141.—Proc. Acad. Nat. Sci. Phila. 1860, 208.—Can. Ent. iii. 208; v. 50; vi. 150.—S. E. Z. xxxiv. 222.—Cin. Quar. Jour. Sci. ii. 111.

T. PULVELLA, Cham.—*Ante*, 99.

T. PRUINOSEELLA, Cham.—Cin. Quar. Jour. Sci. ii. 110.—*Ante*, 97.

T. QUERCITELLA, Clem.—Tin. Nor. Amer. 221.—Proc. Ent. Soc. Phila. ii. 13.—Can. Ent. iii. 208.—S. E. Z. xxxiv. 221.—Cin. Quar. Jour. Sci. ii. 111.—Bei. z. Kennt. 1875, 146.—*Ante*, 97.

T. QUERCIVORELLA, Cham.—Cin. Quar. Jour. Sci. ii. 109, 111.—*Ante*, 97.

T. ROSETICOLA, Frey & Boll.—S. E. Z. xxxiv. 223.—Cin. Quar. Jour. Sci. i. 210; ii. 112.

T. SOLADIGINIFOLIELLA, Clem.—Tin. Nor. Amer. 80, 81.—Proc. Acad. Nat. Sci. Phila. 1859, 326.—Can. Ent. iii. 208.

T. TINCTORIIELLA, Cham.—Cin. Quar. Jour. Sci. ii. 108, 111.

T. ZELLERIELLA, Clem.—Tin. Nor. Amer. 80, 81.—Proc. Acad. Nat. Sci. Phila. 1859, 326.—Can. Ent. iii. 208.—S. E. Z. xxxiv. 220.—Cin. Quar. Jour. Sci. ii. 109 *et seq.*—Bei. z. Kennt. 1875, 147.—*Ante*, 98.

TRIFURCELLA. (Zeller.)

T. OBRUTELLA, Zell.—Bei. z. Kennt. 1873, 116.

(TRICHOTAPHE. Clemens.)

(*T. flavicostella*, *juncadella*, *serrativittella*, *setosella et ochrepalpella*, Clem. *vid. sub Gelechia.*)

TRIPANISMA. Clemens.

T. **PRUDENS**, Clem.—Tin. Nor. Amer. 125.—Proc. Acad. Nat. Sci. Phila. 1860, 168.

(VENILIA. Chambers.)

(*T. albapalpella*, *vid. Eido albapalpella.*)

WALSHIA. (Clemens.)

W. **AMORPHÆELLA**, Clem.—Tin. Nor. Amer. 241.—Proc. Ent. Soc. Phila. ii. 419.—Rep. Nox. Ins. Mo. iii. 133.

WILSONIA. (Clemens.)

W. **BREVIVITTELLA**, Clem.—Tin. Nor. Amer. 254.—Proc. Ent. Soc. Phila. ii. 428.

XYLESTHIA. (Clemens.)

X. **CLEMENSELLA**, Cham.—Can. Ent. v. 174; ix. 208.
X. **CONGEMINATELLA**, Zell.—Bei. z. Kennt. 1873, 18. ?=*clemensella.*
X. **PRUNIRAMIELLA**, Clem.—Tin. Nor. Amer. 39, 54, 59, 60.—Bei. z. Kennt. 1873, 17.

YPSOLOPHUS. (Haw.)

Y. **CARYÆFOLIELLA**, Cham.—Can. Ent. iv. 224.
Y. **CONTUBERNALELLUS.**
(*Chætochilus contubernalellus*, Fitch.)—Rep. Nox. Ins. N. Y. n. 1, 231; n. 3, sec. 44.
(*Y. eupatoriiella*, *vid. Nothris eupatoriiella.*)
Y. **FLAVIVITTELLUS**, Clem.—Tin. Nor. Amer. 254.—Proc. Ent. Soc. Phila. ii. 429.—Bei. z. Kennt. 1873, 83.
Y. **MALIFOLIELLUS.**
(*Chætochilus malifoliellus*, Fitch.)—Rep. Nox. Ins. N. Y. n. 1, 221; n. 3, sec. 43.
Y. **PAUCIGUTTELLUS**, Clem.—Tin. Nor. Amer. 228.—Proc. Ent. Soc. Phila. ii. 124.—Bei. z. Kennt. 1873, 83.
Y. **POMETELLUS.**
(*Rhinosia pometellus*, Har.)—Treat. Ins. p. —.
(*Chætochilus pometellus*, Fitch.)—Rep. Nox. Ins. n. 1, 221; n. 3, sec. 42.
Y. **PUNCTIDISCELLUS**, Clem.—Tin. Nor. Amer. 228.—Proc. Ent. Soc. Phila. ii. 124.—Bei. z. Kennt. 1873, 85.

Y. **QUERCICELLA**, Cham.—Can. Ent. iv. 223 *et seq.*—*Ante*, p. —.
Y. **QUERCIPOMONELLA**, Cham.—Can. Ent. iv. 223 *et seq.*
Y. **RUDERELLA**, Cham.—Can. Ent. iv. 222. (? Var. *pometellus.*)
Y. **STRAMINEELLA**, Cham.—Can. Ent. iv. 224. (? Var. *punctidiscellus.*)
Y. **TRIMACULELLUS**,
(*Chætochilus trimaculellus*, Fitch.)—Rep. Nox. Ins. N. Y. n. 1, 223.
Y. **UNICIPUNCTELLUS**, Clem.—Tin. Nor. Amer. 229.—Proc. Ent. Soc. Phila. ii. 125.—Bei. z. Kennt. 1873, 86.
Y. **VENTRELLUS.**
(*Chætochilus ventrellus*, Fitch.)—Rep. Nox. Ins. n. 1, 224.

ART. VI.—DESCRIPTIONS OF NOCTUIDÆ, CHIEFLY FROM CALIFORNIA.

By A. R. Grote.

I am indebted to Mr. Henry Edwards for a number of specimens of Californian *Noctuidæ*, which are partly described in the present paper. What is needed is larger and fresher material than has as yet reached me. In previous papers, I have shown that some species have a wide range from east to west and from south to west: *Agrotis velleripennis*, originally described from the Middle States, I have now from Oregon; *Heliothis cupes*, originally described from Texas, I have received, under its synonym, *Heliothis crotchii*, from California. But the Californian *Noctuidæ* seem, as a whole, quite distinct, and resemble perhaps the Northern Asiatic and European species as much as they do those from the Atlantic district. The collections which have as yet reached me are not extensive enough to allow me to judge finally in the matter.

APATELA PALLIDICOMA, *n. sp.*

♀.—Allied to *rubricoma*, but much smaller, more shaded with white, and with the lines more diffuse. T. a. line with the lobes deeper and more prominent. Stigmata reduced as compared with *rubricoma*, especially the reniform. T. p. line a little nearer the outer edge of the wing, dentate and lunulate. Terminal series of black dots distinct. Hind wings soiled whitish, with whitish fringes. Beneath whitish, with obsolete line. While very distinct in appearance, the ornamentation is seen to be much like that of *rubricoma*. Two specimens examined. Massachusetts (*L. W. Goodell*, No. 777); New York. *Expansion*, 36 millimetres.

AUDELA ACRONYCTOIDES, *Walk.* Can. Nat. Geol. vi. 37.

The type is in Coll. Can. Ent. Soc. (*see* Can. Ent. ix. 27). I have seen *Panthea leucomelana* Morr. (♀) in Professor Fernald's collection. I believe it to be this same species.

AGROTIS JANUALIS, *n. sp.*

♂ ♀.—Allied to *badicollis*. Fore tibiæ unarmed; ♂ antennæ pectinate. Purplish brown, warmer-tinted beneath. *Reniform pale, discolorous.* Orbicular concolorous. Lines indicated *obliquely* on costa, else fragmentary, their course much as in *badicollis*. Terminal line obsolete; subterminal very faint. Hind wings fuscous in both sexes, with concolorous or reddish fringes. Head pale; collar ochrey-brownish, *without* any line. Antennæ pale at base. Beneath with common line indented opposite cell on secondaries, which show a faint discal cloud-spot. Thorax brown. *Expansion*, 36 to 40 millimetres. Albany (*Professor Lintner*, a number of specimens; also, from *Dr. Bailey*, No. 64). Seems to differ from *dilucida* by the pale reniform and rounded orbicular; varies in depth of color. I am indebted to Mr. Thaxter for an opportunity of seeing Mr. Morrison's type. The t. a. line is outwardly oblique on costa, as in *badicollis*. I do not think the discal shading a specific character. The collar seems to want the narrow line of *badicollis*.

AGROTIS DILUCIDA, *Morr.* Pr. Ac. N. S. Phil. 55.

I have seen the type from Mr. Thaxter's collection. It seems to differ from *badicollis* in its larger size and the want of the light brown collar; the ordinary spots are farther apart and the orbicular more rounded and less elongate. Specimens are before me also from Albany, N. Y. (*Dr. Bailey* and *Mr. Hill*). The " male specimen", in which " the reniform is white and contrasting ", probably belongs to *janualis*. The small orbicular is distinctive of *janualis* as compared with *badicollis* or *dilucida*.

AGROTIS OPACIFRONS, *n. sp.*

♂ ♀.—All the tibiæ spinose. Male antennæ pectinate. Front black, discolorous. Brownish-gray, very similar in appearance to *dilucida*, but more reddish-brown in tint. Collar and thorax concolorous, unlined. Palpi wholly brownish. Lines blackish, fragmentary, marked on costa. Stigmata concolorous, orbicular preceded and followed by blackish-brown shading on cell; claviform obsolete. Wings concolorous. Posterior line denticulate. The female has the orbicular large and open to costa, the male smaller and nearly closed; in both, the spot is oblique; reniform moderate. Hind wings fuscous in both sexes, with pale fringe; the discal lunule is marked. Beneath yellowish-fuscous, in the female shaded with reddish; discal marks and obliterate common line. *Expansion*, 38 millimetres. Centre, N. Y., August (*W. W. Hill, esq.*).

AGROTIS APPOSITA, *n. sp.*

♀.—Fore tibiæ unarmed. Of a burnt umber brown; thorax darker. Median space narrowed, the median lines approximate; t. a. line slightly lobed, outwardly oblique, dark brown, with a broad preceding pale shade; t. p. line indistinct, narrow, indented opposite the cell, slightly lunulate, followed by a pale shade; the median space paler than the rest of the wing. Orbicular rounded, moderate, with faint black annulus, stained with reddish, and pale; reniform near t. p. line, moderate, with dark and reddish-stained centre and pale border. Median shade dark and diffuse; claviform obsolete. Fringes concolorous; s. t. line fine and pale. Hind wings dark fuscous, with pale fringes. Beneath pale, with reddish tinge, irrorate; a faint common mesial line near the discal dots, which are small, and appear to be empty; on primaries a subterminal shade. *Expansion*, 34 millimetres. Vancouver Island (*Mr. Henry Edwards*, No. 5626).

AGROTIS JUNCTA, *n. sp.*

♂.—Size of *treatii*, which this species resembles in its dead black primaries. Collar black at base, pale-tipped. Head pale; thorax brown; abdomen pale fuscous. Fore wings with the t. a. line rounded, black; attached to it is the black, pale-margined claviform. Ordinary spots concolorous, large, finely outlined with pale and fused below; the claviform apparently touching the orbicular at base. S. t. line followed by small pale marks. Hind wings pale fuscous. Beneath pale, with indistinct common line, and discal marks obsolete. Nova Scotia (*Mr. Roland Thaxter*). One specimen.

AGROTIS MICRONYX, *n. sp.*

♀.—All the tibiæ spinose. Fore wings fuscous, with a whitish-gray cast. T. a. line perpendicular, black, with two subcostal teeth opposite the orbicular, thence twice very slightly waved to internal margin, preceded by a whitish-gray shade. Orbicular rather large, rounded, gray, annulate with black; reniform finely and subobsoletely annulated with black, and with a gray border, angulated exteriorly, and nearly touching the orbicular behind. T. p. line lunulate, tolerably even, obsoletely double, with an interior gray shade. S. t. interspace wide; s. t. line gray, preceded by a faint brown shading. A terminal series of dark dots alternating with similar dots at the base of the concolorous fringes. Hind wings dark fuscous, with pale interlined fringes. Beneath pale fuscous, with common, even, subdentate line and discal marks. *Expansion*, 30 millimetres. California (*Henry Edwards*, No. 4411). Appears to belong to the *messoria* group, but is very different in appearance.

AGROTIS MERCENARIA, *n. sp.*

♂.—All the tibiæ armed; antennæ simple; body depressed. Allied to *inconcinna* and *auxilliaris* rather than to *clandestina*. Entirely fuscous; lines faint, double. Stigmata concolorous, all three narrowly outlined in black. Claviform rather long and narrow. Hind wings fuscous, subpellucid, with pale interlined fringes. Beneath much as in *auxilliaris*. *Expansion*, 42 millimetres. Texas, November 12 (*Belfrage*, No. 586, red label).

AGROTIS IDAHOENSIS, *n. sp.*

♂.—Allied to *costata*, but differing in color. Primaries narrow, purple-fuscous. Costa broadly shaded with lilac-gray at base, absorbing the orbicular above. Orbicular gray, oblique, rounded below not angulate as in *costata*. Reniform gray, smaller and narrower than in its ally. At base below median vein is a rich blackish shade and between the discal spots. Claviform large, concolorous, faintly outlined. T. p.

line as in *costata*, indistinct. S. t. line near the external margin with some preceding cuneiform marks; terminal space darker-shaded. Hind wings and under surface of both pairs plain pale fuscous. Collar with a mesial black band. *Expansion*, 32 millimetres. Idaho (*Henry Edwards, esq.*, No. 6525).

AGROTIS ROSARIA, *n. sp.*

♂.—Antennæ simple, pubescent beneath; all the tibiæ armed. Allied to *conflua*, but stouter, and with possibly a nearer European representative. Rosy-brown. Stigmata discolorous, ochrey. Lines double, nearly even and perpendicular. Orbicular with dark annulus, moderate, nearly spherical, situate near the t. a. line. Claviform obsolete. Reniform indented outwardly, moderate, its lower portion ill-defined. Subterminal line pale, slightly sinuate. An even, fine, dark line margins both wings. Secondaries with a mesial line; fringes rosy. Beneath with a diffuse common line and faint discal marks. Body concolorous. *Expansion*, 35 millimetres. California (Nos. 2199 and 149, *Mr. Henry Edwards*).

AGROTIS EVANIDALIS, *n. sp.*

♂.—Eyes naked; all the tibiæ armed. Allied to *subgothica;* a little stouter than that species, paler-colored, and the antennæ are more strongly bristled. Thorax and abdomen soiled pale ochrey. Fore wings colored like *subgothica;* the claviform shorter, surmounted by a broad, pale stripe, which extends to internal angle; reniform more rounded, stained with light yellow. Subcostal, median, and submedian veins striped with white at base. Orbicular whitish, triangulate, absorbed superiorly. Subterminal space and terminal much as in *subgothica*. Hind wings whitish, with broad, diffuse borders. Beneath pale, with discal points; those on primaries pale-ringed. Size of *subgothica*, or a little larger. California.

AGROTIS ERIENSIS, *n. sp.*

♂.—All the tibiæ armed. Size of *manifestolabes* and similarly colored. Ochre and reddish-brown. Antennæ simple, and thus differing at once from its ally. Front and collar ochrey; thorax reddish-brown; anal hairs ochreous. Base of primaries and costal region diffusely ochrey; else the wing is reddish-brown. Lines black, broken, illegible. Stigmata faint, shaded with ochrey, moderately large. Subterminal line nearer the external margin and more even than its ally, preceded by dark points. Hind wings pale fuscous, with yellowish fringes. Beneath much as in *manifestolabes*, common line and discal points. One specimen, Erie County, New York (collected by *A. R. Grote* in July).

AGROTIS LACUNOSA, *Morrison*, MS.

♂.—Allied to *sexatilis*. Dull wood-brown, without costal shading. Stigmata smaller and more oblique; reniform narrower; orbicular more decumbent than in its ally. Median and terminal spaces darker than the rest of the wing. Head and thorax dark brown; collar with a narrow mesial line. Hind wings whitish in the male, with a very narrow smoky border and white fringes. Beneath pale, with discal marks and faint common line. Antennæ brush-like. *Expansion*, 35 millimetres. California. Type in Coll. Buf. Soc. Nat. Sci.

This is the form I have doubtfully referred to *obeliscoides*. I do not know Guenée's species, which I think cannot be *sexatilis* or the present species.

AGROTIS ATRIFERA, *n. sp.*

♂♀.—All the tibiæ spined. Male antennæ simple, pubescent, with pairs of simple bristles on the joints. Allied to *choris;* of a grayish-fuscous; collar with a black central line; a black basal dash; a black dash before orbicular and between the ordinary spots. Stigmata concolorous; orbicular large, oblique, incomplete above; reniform subequal. T. p. line faint, double, tolerably even. S. t. line faint, near the margin, with some preceding black streaks. Hind wings whitish, with vague smoky borders, subpellucid. Beneath pale, whitish, powdery; traces of exterior shade on primaries; else the usual markings are obsolete. *Expansion*, 35 millimetres. Nos. 5201, California, and 4581, Sierra Nevada (from *Mr. Henry Edwards*).

AGROTIS BICOLLARIS, *n. sp.*

♂♀.—Clay-colored; belonging to the group of *cupida*, but smaller than the other species, except *brunneipennis*. Collar with a mesial black band. Fore wings clay-color, with the marks black, fragmentary. Reniform moderate, concolorous, stained with fuscous; orbicular rather long, concolorous, black-ringed, tending to be incomplete above. T. p. line geminate, tolerably even. S. t. line near the margin, strongly angulate below costa, followed and preceded by dark shading. Fringes fuscous, paler-tipped, yellowish at base. Hind wings dark fuscous; veins darker; fringes interlined, yellowish at base, whitish outwardly. Beneath pale, irrorate; secondaries show lunule and diffuse outer line. *Expansion*, 28–30 millimetres. Havilah, Cal. (*Mr. Henry Edwards*, Nos. 6524 and 6517).

The California fauna is rich in species belonging to the group which is represented in the East by *cupida*, *brunneipennis*, *alternata*, and *placida*. These have been mostly described by myself in the third volume of the Bulletin of the Buffalo Society of Natural Sciences. I repeat here some of the characters for the convenience of the student:—

Agrotis cupidissima.—Nearest to *cupida;* similarly sized, but paler, with the orbicular incomplete superiorly. Varies by the primaries becoming clay-colored without markings. Collar unlined.

Agrotis lætula.—Darker than the preceding, purple-brown, with powdery ochrey markings; claviform indicated. Collar unlined. A little smaller than *cupidissima*.

Agrotis orbis.—Closely allied to *alternata.* Stigmata complete; orbicular very small, pale-ringed, spherical. Unicolorous olivaceous-gray, shining; terminal space hardly paler. Possibly a variety of *alternata*, but the spots are concolorous.

Agrotis emarginata.—Rather narrow-winged. Dark purple brown; concolorous; ornamentation subobsolete; lines darker than the wing; orbicular incomplete above. Collar with a distinct, black, superior edging.

Agrotis facula.—Broader and shorter-winged than *emarginata.* Brown, with the primaries overlaid with lilac-gray, especially on costa and over stigmata. Cell shaded with black between the ordinary spots and before the orbicular; the latter absorbed into the gray costal shade. Collar with a very fine blackish edging.

Agrotis formalis.—Collar with a fine, mesial, white line; upper portion black. Colors of *facula*, but without black on disk and before orbicular. Gray costal shade evident.

Agrotis observabilis.—Collar with upper half black; lower part reddish or ochrey. Costal margin reddish; varies by the presence of black on the cell and before the orbicular, or its absence when these places are sometimes olivaceous or reddish. A black basal dash; claviform distinct. The collar is similar to *formalis;* but the color is different, being fuscous, overlaid with reddish and olivaceous.

Agrotis bicollaris.—Looks like a small, pale *cupidissima*, but the collar has a mesial black band.

AGROTIS PLURALIS, *n. sp.*

♀.—All the tibiæ spinose. Allied to *pleuritica*, but the orbicular is oblique, subquadrate. Gray and pale ochreous. Fore wings gray along costal and internal margins, diffusely shaded with pale yellowish-ochrey from the base over the claviform along submedian fold to subterminal line and again beyond the reniform. All filled in with brown. Stigmata gray, whitish-ringed; reniform upright; orbicular oblique, quadrate; claviform faintly outlined, absorbed by the ochre shading. Lines geminate, marked on costa, subobsolete; subterminal pale, irregular; terminal space gray; terminal line black, subcontinuous. Veins marked with blackish; veins 3 and 4 edged with whitish; a dark shade before subterminal line resolved into dashes or cuneiform marks between veins 2 and 5. Fringes gray, interlined; externally brown, dotted opposite extremity of veins. Hind wings smoky, subhyaline toward the base; fringes white, interlined. Thorax gray; collar at base light ochrey; tegulæ lined within with ochreous. Beneath white, powdered with fuscous; double obliterate lines and discal marks; abdomen whitish above, darker beneath.

Expansion, 38 millimetres. Two specimens, Nevada (coll. *Dr. Bailey*).

With differently colored shadings, this species recalls *milleri*, but the stigmata are differently shaped and the t. p. line has a different expres-

AGROTIS ALBALIS, *n. sp.*

♀.—All the tibiæ spinose. Appears to belong to the group of *silens* and *lagena* (two specimens of this latter from Nevada are sent in the present collection), but it is whiter, and all ornamentation is obsolete. Fore wings gray, white over dusky. There are patches before the subterminal line, as in *milleri*, but the line is more dentate and deeply indented opposite the cell. Median lines lost. Stigmata barely indicated. At the place of the orbicular is an ochrey-stained, small spot, v-shaped, finely bordered with black; the apex turned to the base of the wing, and apparently connected exteriorly by an ochrey-white shading on the cell with the small, upright, whitish-ringed reniform. Fringes checkered gray and whitish. Hind wings whitish, with a very faint terminal, smoky shading; fringes white, with a nearly obsolete, dotted interlining. Head and thorax gray; abdomen whitish. Beneath white, sprinkled with dark scales, without markings. *Expansion*, 37 millimetres. Nevada (*Dr. Bailey*). The lines on primaries are barely indicated, appearing even, not dotted. A faint white, basal, submedian streak.

AGROTIS MIMALLONIS, *Grote.*

This is one of our handsomest species. The lines on primaries are variably distinct. Dr. Bailey has sent me the female from Centre, N. Y. It has the hind wings white as in the male, but there is a smoky border to them, more or less well defined. In the Western species *gagates*, the hind wings are all smoky, subpellucid in the female; the primaries are more obscurely colored, and, while the ornamentation is similar, the subterminal line is distinctly pale, powdery, and irregular in the Colorado form.

AGROTIS CAMPESTRIS, *Grote.*

I have both sexes of *albipennis*, which seems distinct from this form. Dr. Bailey, of Albany, has sent me an interesting series of *campestris*, varying from bright brown to black. For the distinction between this species and *decolor*, I refer the student to the Bulletin of the Buffalo Society of Natural History, vol. 3, No. 5.

AGROTIS FISHII, *n. sp.*

♂ ♀.—In color and appearance resembling *janualis*, but the tibiæ are all spinose. Obscure purple gray. The orbicular obsolete. Lines fine, black, single, dentate. Half-line visible. T. a. line erect, with two small, sub-equal projections on cell and below costa. Median shade outwardly oblique, running to lower extremity of reniform; this latter is moderate, and filled in with greenish-white scales. T. p. line dentate, forming points on the veins. Subterminal line with a blackish, preceding shade at its inception on costa, interrupted, forming two marks opposite the cell very slightly margined outwardly with greenish-white. A terminal black line almost continuous. Hind wings fuscous with reddish fringes. Thorax concolorous purple-gray; no line on collar.

Beneath, body and legs obscure purplish, abdomen reddish. Wings reddish-fuscous, with common dark shade line, and discal marks equally distinct. *Expansion*, 33 millimetres. Oldtown, Me. (*Mr. Charles Fish*). The primaries are more pointed at apices than in *janualis*. The dark shade before s. t. line and obsolete orbicular are strong characters. The male antennæ are pyramidal-toothed, ciliate; hind wings pale fuscous.

HADENA VIGILANS, *n. sp.*

♀.—Eyes naked, lashless. Abdomen untufted; thorax tufted at base; legs unarmed. Blackish purple-brown, deeper-shaded over costal region. Collar and base of head pale yellowish, discolorous. Subterminal line near the margin, pale, followed by dark scales, which become velvety-black below vein 3. Four pale anteapical dots, wide apart. Median lines obliterate. Discal marks distinct, well-sized; reniform with a velvety-black annulus on the inside, excavate outwardly, filled in with whitish scales; orbicular concolorous, subequal, outwardly oblique, with complete velvety-black annulus. Hind wings pale fuscous, with double, diffuse, subterminal band and discal lunule reflected from beneath. On the under surface, the discal lunule on primaries is open, on secondaries solid; the hind wings are powdered with brownish; fore wings blackish. Abdomen like hind wings; thorax like primaries. Above, the primaries show a little reddish staining at the base, along the s. t. line and on median space. *Expansion*, 32 millimetres. Orono, Me. (*Prof. C. H. Fernald*).

This species is easily known by the characters of the subterminal line and stigmata.

HADENA CRISTATA, *Harvey*, MS.

♂.—Thorax ferruginous, strongly crested; body comparatively slender; abdomen tufted; size large. Fore wings dusky ochreous, with all the markings dotted and fragmentary. Lines marked in black on costa. Reniform barely indicated with a black, central dot. T. p. line a double series of black dots, the inner line represented by a white curved streak crossing a dark shade on submedian fold, thus allying the moth to *cuculliiformis* and *verbascoides*. Terminally the wing is shaded blackish, twice more prominently at the middle and at internal margin across the narrow, pale s. t. line. Fringes blackish, cut with ferruginous-ochrey at end of veins. A fine ferruginous basal streak and internal margin shaded with rusty. Hind wings fuscous, with rusty-ochre fringes, and shaded with ochrey along external margin. Beneath pale ochrey, with rusty tinge; on hind wings a waved mesial line marked on the veins and a discal lunule. Primaries with lunule and straight line, double and angulate at costa. *Expansion*, 45 millimetres. Buffalo (*A. R. Grote*).

HADENA DUCTA, *n. sp.*

♀.—A large species resembling *castanea* and some of the European allied forms in appearance. Abdomen tufted. Fore wings black or blackish. Subterminal line powdery, white, narrow, continuous, preceded and followed by deep black interspaceal dashes; the usual W-mark indicated, not very prominent; fringes blackish, dotted with pale at ends of veins. Reniform large, black-ringed, filled in with powdery, whitish scales; orbicular large, spherical, also slightly pale-powdered; claviform concolorous, moderate; a black shade along submedian fold connecting the two lines below where they are most approximate. Ordinary lines double, inconspicuous; median shade black, rather faint; t. p. line lunulate. Hind wings blackish with pale disk and fringes, which are interlined. Thorax blackish; tarsi pale-dotted. Beneath, the wings are powdered with blackish; hind wings paler, with black discal spot and mesial irregular shade. *Expansion*, 40 millimetres. Orono, Me. (*Professor Fernald*).

HADENA TUSA, *n. sp.*

♂ ♀.—Smaller than *curvata*, without the prominent excavation of the secondaries. Eyes naked; thorax and abdomen tufted. Blackish-brown; ornamentation indistinct. Terminal space dark, culminating in a black shade above internal angle. Median lines geminate, tolerably approximate. Ordinary spots paler than the wing; reniform with interior black annulus and inferior black stain. Claviform brown, and there is a narrow, sometimes incomplete dash across the median space connecting the lines submedially where they are more approximate. Hind wings pale fuscous, with moderate smoky borders; fringes pale, interlined. Beneath pale, irrorate with brownish, with vague double exterior lines. Abdomen pale fuscous, with blackish tufts. Thorax blackish-brown; tegulæ darker; a narrow black line on collar. *Expansion*, 28–30 millimetres. California (*Mr. Henry Edwards*, No. 5985; *Mr. Behrens*, No. 983).

HADENA OCCIDENS, *n. sp.*

♂ ♀.—One of the largest species, somewhat resembling *arctica*. Eyes naked, tibiæ unarmed, abdomen with dorsal crests on the four basal segments, of which the third is most prominent. Whitish-gray; in one specimen the median space is shaded with brown, so that the resemblance to *arctica* is obvious; in the other (♀), the brown is entirely absent. Lines geminate, distinct. A basal black dash below the half-line. Anterior line even, outwardly produced submedially, and here narrowing the median space. Claviform small, outlined in black approaching the median shade. Posterior line scalloped interspaceally, much drawn in below the submedian vein, and so narrowing the median space inferiorly. Stigmata very large, shaded with pale ochrey, especially the ovate orbicular, annulate with blackish, the gray reniform with an interior ring. Subterminal line pale, preceded by a diffuse pale ochrey shading over s. t. space medially; the line is pale, limited by incomplete dark lines, of which the inner is in one specimen distinctly ochreous, twice drawn in; at its last inflection at internal angle it is preceded and followed by a distinct black shading. Terminal black line broken into interspaceal dots; fringes gray, with narrow pale basal line, and obsoletely cut with pale, distinctly on under side. Hind wings pale smoky, veins marked, alike in both sexes, with white interlined fringes. Thorax gray, the tuftings tipped with ochreous. Beneath whitish, with double outer lines and discal lunule on hind wings; primaries fuscous, with indistinct open discal mark. *Expansion*, 45 millimetres.

HAB.—Nevada (*Dr. Bailey*).

This is a stout species, nearest to *arctica*, from which it may be known at first sight by the gray color and the drawing-in of the transverse posterior line on vein 2 to within the reniform.

HADENA DEVASTATRIX (*Brace*).

A specimen sent me by Dr. Bailey from Nebraska has the primaries very pale, setting off the ornamentation. It bears some resemblance to my material of *exulis* from Labrador.

HADENA FLAVA, *Grote*, Proc. Ent. Soc. Phila. Sept. 1874.

The type of this species is from British Columbia. A specimen collected by Belfrage in Texas hardly differs. Another (♀) collected by Ridings in Colorado (which I took to the British Museum, in 1867, to compare) has the fore wings paler, but else seems the same species; the ovipositor is exserted. I now receive from Mr. Henry Edwards a specimen of his *Pseudanarta crocea*, and I find it much the same as the Colorado specimen collected by Ridings. The eyes are naked, and I do not think the moth can be generically separated from *Hadena*, although the yellow hind wings give it a very distinct appearance, to which I have alluded in my original description. The tibiæ are unarmed, and its resemblance to *Anarta* merely lies in the yellow secondaries, which it shares with *cordigera*.

DRYOBOTA OPINA, *n. sp.*

♂ ♀.—Eyes naked, lashed. Antennæ of the male rather lengthily bipectinate. Dark brown. Primaries with the median space shaded with black. Claviform blackish. Orbicular spherical, filled with pale powdering. Reniform moderate, with pale interior annulus. T. p. line even. Subterminal space red-brown. S. t. line preceded by a blackish shade, forming interspaceal, cuneiform marks and followed by short, dark, linear dashes. Fringes paler than the wing. Hind wings soiled yellowish-white, with a mesial fuscous line, discal point, and terminal line; fringes pale. Thorax obscure brownish. Beneath pale, powdered with brown; distinct discal marks and an exterior common line. *Expansion*, 30 millimetres. California (*Mr. Behrens*, and *Mr. Henry Edwards* in October).

The *Dryobota californica* of Dr. Behr's MSS. has hairy eyes, and had been described by myself under the genus *Xylomiges*, to which it belongs.

ARZAMA DIFFUSA, *n. sp.*

♀.—Eyes naked; front without tubercle; body stout; abdomen terminating with a close, mossy tuft, as in some *Bombycidæ*, and as in *obliquata*. Dusky ochrey; t. a. line black, even, outwardly and roundedly projected on the cell; median space about the reniform and before the median shade diffusely shaded with black; reniform much as in *vulnifica*, as also the t. p. line, but this is black, not ferruginous; s. t. line even, angulated in vein 5, followed by blackish shading on terminal space. Terminal line dark, even, interrupted by the veins. Hind wings warm fuscous, with pale fringe; beneath reddish-fuscous; hind wings paler, with large discal dot, and diagonal, slightly irregular, mesial shade-band. Body concolorous; thorax shaded with blackish behind the collar. *Expansion*, 47 millimetres. Maine (*Prof. Fernald*). Differs structurally from *obliquata* by the smooth front, and seems to be very near *vulnifica*.

Mr. Butler, of the British Museum, kindly informs me that *Arzama densa* has a smooth front. It is thus congeneric with *diffusa* and *vulnifica*. For *obliquata*, with its horned clypeus, I propose the generic term *Sphida*.

DORYODES BISTRIALIS.

Agriphila bistrialis, Hübn. Zutr. 775–776.
Doryodes acutaria, H.-S. et Guenée.

A study of Hübner's "Zutraege" has satisfied me that we must revert to an older name for this moth.

SCOLECOCAMPA BIPUNCTA (*Morr.*).

I have identified this species collected by Mr. v. Meske at Albany. It does not seem to me generically distinct from *liburna*, though hardly more than half the size; the palpal structure is the same. The dot which forms the reniform is represented in the same place on the annulus in *liburna*.

UFEUS UNICOLOR, *n. sp.*

♂.—All the tibiæ spinose; the naked eyes heavily lashed. This form shares all the characters of *satyricus* or *plicatus*, the flattened body and hirsute abdomen. It is of a unicolorous smoky-fuscous, with paler secondaries. The fore wings show no trace of lines or spots; there is a powdering of black scales on the veins, and perhaps a feeble indication at the usual place of the exterior line. The color is that of *satyricus*, the size that of *plicatus*. *Expansion*, 38 millimetres. Illinois (*Mr. Bean*, No. 606).

The fore tibiæ are spinose in this species and *plicatus*; they are probably also spined in *satyricus*, though I have not been able to detect the spines in my material of the latter species.

PYROPHILA GLABELLA, *Morr.*

Havilah, Cal. (*Mr. Henry Edwards*, No. 6589). The specimen does not differ essentially from one sent me from Illinois by Mr. Thomas E. Bean.

ZOTHECA TRANQUILLA *var.* VIRIDULA.

I have received two specimens of *tranquilla* from California, which, instead of being pale reddish-brown over the thorax and primaries, are pale green, and to this color-variety, which is sufficiently extraordinary, I give the above name. The simple markings of the typical form are evident, but at first sight no one would refer the two to the same species.

GRAPHIPHORA CONTRAHENS, *n. sp.*

♂.—Form slight. Eyes hairy. Tibiæ unarmed. Thorax hairy, untufted. Fuscous over faded ochreous. The primaries are darker-shaded over the costal region, above the middle of the wing, to the reniform; again over terminal and subterminal spaces at the middle and on costa, where three pale dots are included. Lines geminate. A dark basal mark. T. a. line waved, upright. Orbicular obsolete. Reniform rather small, rounded, concolorous with the pale ochre tint of the wing, which extends beyond it to apices. T. p. line slightly sinuate, contiguous to reniform. A black, interrupted, terminal line. A pale line at base of fringe. Hind wings dirty white, with dark, interrupted, terminal line. Beneath whitish; fore wings shaded with fuscous on the disk, with a common, dark, slightly irregular line and discal points. Thorax mixed grayish. *Expansion*, 38 millimetres. Nova Scotia (No. 2378, *Mr. Thaxter*).

I have seen a specimen of this species, labelled "*Celæna-contrahens* Walker", in Coll. Can. Ent. Soc.

LITHOPHANE VIRIDIPALLENS, *Grote.*

♂.—Pale gray-green; lines on primaries darker-shaded. Allied to *querquera*, but differing at once by the absence of the black markings and the narrower reniform. Thorax with a central black dot; edges of the tegulæ faintly lined. Lines on primaries double; median shade fuscous or blackish, upright, diffuse, dentate. Subterminal line without the black markings of *querquera* at the middle, and again on submedian fold. Terminal dots reduced. Hind wings fuscous, with whitish fringes, not ruddy as in *querquera;* beneath with a faint flush. Size of *querquera.* Massachusetts (*Mr. Roland Thaxter*).

LITHOPHANE CAPAX, *G. & R.*

This species has the tibiæ unarmed. Notwithstanding its broader wings, it must be referred to *Lithophane;* it is not congeneric with *Anytus sculptus* Grote, which has spinose tibiæ.

LITHOPHANE LEPIDA, *Lintner MS.*

Fore wings dark purple-gray; lines distinct, dentate, irregular. A fine black basal streak. Half-line deeply dentate on median vein. Anterior line dentate, forming a large tooth below submedian vein, which nearly touches a prolonged sharp tooth from the posterior line. Orbicular a little oblique, reniform subquadrate; both stigmata concolorous, with black annuli, and shaded interior ringlets. Posterior line with acutely dentate teeth over submedian nervules, nearly touching the reniform, forming a double tooth submedially, the first and shortest on vein 2, the second nearly touching the opposite tooth of the anterior line shaded with black. Fringes concolorous with minute white points opposite the veins. Hind wings concolorous fuscous, with an exceedingly strong even reddish tint; fringes concolorous. Beneath, both wings saturated with reddish, fuscous discal marks, and a faint common shade-line. Thorax like primaries; tegulæ touched with white at the sides; abdomen purplish. *Expansion*, 40 millimetres. Oldtown, Me. (*Mr. Charles Fish*). It cannot be mistaken for any other from its purplish primaries with distinct marks, the shape of the t. p. line, and the warm tint of the hind wings.

The following is a list of our North American species of *Glæa* :—

GLÆA, Hübner; Stephens.
  † HOMOGLÆA, Morrison.
    ♂ *antennæ pectinate.*
      hircina, *Morrison.*
      carnosa, *Grote.*
  † † CERASTIS, Ochs.
      viatica, *Grote.*
      inulta, *Grote.*
      olivata, *Harvey.*
  † † † EPIGLÆA, Grote.
    Dorsum of thorax with a mesial ridge.
      deleta, *Grote.*
      decliva, *Grote.*
      apiata, *Grote.*
      venustula, *Grote.*
        ? *sericea*, Morr.
      tremula, *Harvey.*
      pastillicans, *Morr.*

All these species are before me; the only Californian form yet described is olivata, *Harvey.*

XYLOMIGES TABULATA, *n. sp.*

♀.—Eyes hairy. Head and thorax in front whitish-gray; collar with a black line; a black line between the antennæ; front fuscous. Fore wings gray, shaded with blackish. Ornamention very like *Lithophane* *tepida*, for which this species may be mistaken, but the yellowish-white abdomen is rounded, not flattened. The transverse lines are double; basal half-line dentate, consisting of a black inner line and pale outer shade. Basal space gray; subbasal space wide, blackish. T. a. line with the outer component line most distinct, pale-centred, upright, waved, dentate on submedian vein, running close to orbicular. The claviform spot large, narrowly and incompletely margined with black, with the orbicular whitish-gray; orbicular not closed on median vein, rounded, upright, ringed with black. A square blackish mark connects the claviform with the t. a. line. Reniform moderate, stained with reddish or ochreous, annulate with white and with an outer incomplete black ring. T. p. line denticulate opposite cell, with a wider submedian inward lunulation, pale gray, with faint inner black line, followed by a narrow blackish shade, widening on costa on subterminal space. Subterminal space whitish-gray, with a squarish black dash on submedian fold before the line which is near the margin, angulate, cut with black fine streaklets. The narrow terminal space is blackish, with a black interrupted terminal line; fringes blackish-gray. Outer margin retreating to internal angle below vein 2. Secondaries whitish, with black discal dot, powdered with blackish or fuscous externally, and narrow, mesial, waved line, accentuated on veins. A distinct, black, terminal line; fringes white. Beneath whitish; fore wings somewhat fuscous; discal dots and faint, common, accentuated, extradiscal line. *Expansion*, 36 millimetres. Centre, N. Y., June (*W. W. Hill, esq.*).

TARACHE SEMIOPACA, *n. sp.*

Allied to *caudefacta*. White. Thorax, head, and basal half of primaries white, immaculate. The median shade-line divides the wing; it is blackish-brown, upright, with a rounded sinus on the cell opposite the spherical, prominent, fuscous, pale-ringed reniform, and a second sinus on submedian fold. The exterior line, somewhat leaden, runs just outside the reniform, which rests on a dark band between the exterior and median shade-lines. Terminally the wing is whitish, crossed by an irregular, subterminal, olivaceous-fuscous shading before the subterminal line. A faint dark shading on terminal space, a terminal series of black points; fringes whitish. Hind wings white, touched exteriorly with fuscous. Beneath, hind wings whitish; fore wings fuscous. Abdomen white. *Expansion*, 18 millimetres.

Helena, Montana, June 21 (*A. S. Packard, jr.*, Hayden's Survey); Nevada.

Very distinct from its allies by the upright, continued, median shade dividing the primaries above.

MELICLEPTRIA PRORUPTA, *Grote.*

Heliothis (*Mel.*) *proruptus*, Grote, Tr. Am. Ent. Soc. 294, Jan. 1873.
Melicleptria venusta, Hy. Edw. Pacific Coast Lep. n. 12, 10.

I have received a specimen from Mr. Henry Edwards, which enables me to make the above synonymical reference. The species is so simply marked that it is impossible to mistake the descriptions. A number of specimens were collected by Lord Walsingham, in Oregon, and, as I understood, California.

ANNAPHILA DIVINULA, *n. sp.*

♂.—This tiny species is even smaller than *decia*; it differs from that species and *depicta* in the white band which crosses the wing from costa to internal angle surrounding the spots on the median space as in *diva* and *superba*. Hind wings yellow, with solid, black base, discal mark, and border. Beneath it differs by the fore wings being pale yellow beyond the arcuate median black fascia, and again apically beyond the outer band, which runs from costa to external margin; the apices are all blackish in allied forms beyond the outer band. *Expansion*, 15 millimetres. California (*Mr. James Behrens*, through *Prof. Fernald*).

This species cannot, from the description, be the var. *germana* of Mr. Henry Edwards. The white band on primaries is as prominent as in *diva*.

Since I established the genus *Annaphila*, the described species have become numerous. They are all Californian, and among the brightest and prettiest of our *Noctuidæ*. There is a distant resemblance to *Brephos*, but structurally they are very distinct; the ocelli are present. I have before me the following nine species:—

ANNAPHILA, *Grote.*
† *Hind wings white.*
    diva, *Grote.*
†† *Hind wings red.*
    superba, *Hy. Edw.*
††† *Hind wings yellow or orange.*
    divinula, *Grote.*
    decia, *Grote.*
        amicula, Hy. Edw.
      depicta, *Grote.*
      lithosina, *Hy. Edw.*
      immerens, *Harvey.*
      mera, *Harvey.*
      danistica, *Grote.*

SYNEDA ALLENI, *Grote.*

♂.—This species resembles somewhat the Californian *adumbrata* or *divergens*; it is, however, on the whole, nearer to *graphica* and *hudsonica*. The fore wings resemble those of *graphica*; but the s. t. line is notched below costa, and the median field is more brownish. It differs by the under surface of both wings being bright orange-yellow, with narrow, black, coalescing bands, which on either wing form a Y-mark. Secondaries orange-yellow above, with the mesial black band narrower; but else the markings much as in its allies.

This fine form was collected in Maine by *Mr. Anson Allen*, to whom I respectfully dedicate the species. It is a little larger than *graphica*, and differs at once by the markings on the under surface of primaries and in color.

MELIPOTIS STYGIALIS, *n. sp.*

♂.—Allied to *nigrescens*, but smaller, and with ill-defined lines or shades on the fore wings. Primaries fuscous, with an ill-defined, paler shade-band beyond the obsolete t. a. line, which is marked on costa. A velvety-black dash on the cell before the narrow, curved reniform, and surmounted by a blackish costal shade. A vague, pale patch in the usual place behind the reniform. T. p. line merely indicated on costa, and beyond it a blackish patch, limited outwardly by the inception of the pale s. t. line, which also vanishes inferiorly. Some black scale-points on internal margin, where the t. a. line and t. p. line may be supposed to terminate; also along inception of t. p. line. Hind wings almost wholly blackish; whitish on disk; fringes white at apices to vein 4, then dusky, again white opposite a yellowish spot between veins 2 and 3, breaking the dark border. Beneath opalescent-white at base, with a black discal streak; the broad, dark border broken as on upper surface, but here the spot is white; fringes as above. Fore wings white at base and beyond the median blackish band; the blackish terminal field is broken by two subterminal superposed white marks before the apices. *Expansion*, 35 millimetres. Illinois (*Mr. Bean*, No. 645).

I think I have noticed this form in the Philadelphia collections. From my material, I am led to suggest that *ochreipennis* may be the male sex of *nigrescens*. I can only repeat that, from actual specimens, I have shown that *fasciolaris* is abundantly distinct from *nigrescens*, and that Mr. Morrison's contrary suggestion, made without knowing Hübner's species in nature, is quite unwarranted.

PANOPODA RUFIMARGO (*Hübner*).

From a series of specimens taken near Buffalo, I can no longer consider *roseicosta* as distinct. The reniform varies by the presence or absence of an inferior black spot. The ground-color varies from dull ochrey to reddish. The lines are variably distinct. I return to my opinion that we have but two species of *Panopoda* so far known, namely: RUFIMARGO of Hübner, to which I would refer *rubricosta* and *roseicosta* of Guenée and my *cressonii* as synonyms, or as designating indefinable varieties; and CARNEICOSTA of Guenée, which may always be known by its color and shape of the t. p. line, while the discal spots are here also subject to great variation in form.

POAPHILA PLACATA, *n. sp.*

♀.—The smallest species yet known. Fore wings dark brown, with a purple reflection. T. p. line diffuse, angulated opposite the cell, sinuate, but not scalloped. Reniform upright, inconspicuous. Subterminal shade barely indicated. The terminal line is very faint, and appears very slightly uneven. Fringes on both wings of a uniform shade of brown, a very little lighter than the wings. Hind wings brown, without marks. Beneath brown, almost concolorous. *Expansion*, 23 millimetres. Georgia (*Mr. Ridings*).

I took this specimen with me to the British Museum, but could not identify it there. In the collection before me, I have *deleta*, *erasa*, *sylvarum*, and *herbicola* of the species described by Guenée in this genus.

POAPHILA IRRORATA, *n. sp.*

♀.—Gray, irrorate with brown. T. a. line whitish, narrow, a little bent, even, followed by a very narrow, brown shade. Reniform indicated by two superposed brown spots. T. p. line like the first line, even, nearly straight, slightly angulated at costa. Subterminal line a series of brown spots. Very minute terminal dark dots, also faintly to be detected on hind wings. Fringes gray. Beneath fuscous-gray, with indications of discal marks on both wings. Palpi prominent. *Expansion*, 30 millimetres. No. 3137, Florida (*Mr. Thaxter*).

ANTIBLEMMA CANALIS, *Grote.*

Two additional specimens (Nos. 401, 402) were taken by me to the British Museum for comparison, and differ from my type by the concolorous reniform, and, in one specimen, by the diffuse brown exterior line. In the type, the reniform is black and the exterior line geminate.

PHEOCYMA, *Hübner.*

I think this generic name will have to be used instead of *Homoptera* Bd. (preoc.?). Hübner's *lunifera* and *fluctuaris* must, however, be positively identified. To the former I provisionally refer a species from Illinois and Texas, which has the basal field darker than the rest of the wing. It does not seem to me to differ generically from *Homoptera*. Prof. Lintner's suggestion that *lunata* and *edusa* are sexes of one species leads me to believe that the white edging in other forms is not specific. What I take to be the ♂ of *penna* shows a white subterminal shade. I observe the same thing in the case of *lunifera* In the present stage of knowledge with regard to this genus, it would be unwise to increase the species without giving figures and certainty as to the sexual characters of ornamentation. In my Check List, I have drawn attention to the seeming want of characters to distinguish *Ypsia* and *Pseudanthracia* from *Pheocyma*. I have elsewhere proposed to distinguish the genus *Zale* of Hübner by the exaggerated discolorous thoracic tuftings. Finally, my material does not contradict the suggestion that *Homoptera atritincta* may be the female of *edusina* of Harvey.

YPSIA, *Guenée.*

In this genus I have both sexes of *Y. aeruginosa*, which do not differ in ornamentation; there is a variation in the amount of green scales in one of the two ♀ specimens before me. I have both sexes of ***undularis***, not differing perceptibly; but of ***umbripennis*** I find I have only females.

ZANCLOGNATHA LÆVIGATA, *Grote.*

A large series shows immense variation in color. The most extreme ♀ variety has the median space ochreous, the basal and terminal fields blackish; this form is very striking. The species may be known by the irregular subterminal line. The reniform is sometimes open; again solid and black; the orbicular is sometimes visible near the t. a. line. Sometimes the median space is bronzed and dark; again the whole wing is concolorous purply-brown; the median shade is sometimes present and again obsolete. The species is common at light and at sugar near Buffalo, N. Y., in June and July.

ZANCLOGNATHA MINIMALIS, *n. sp.*

♂ ♀.—Half the size of *cruralis* or *lævigata.* Of the same dusty ochrey color, varying in depth (one ♀ very dark). Fore tibiæ of the male with the usual brush of pale and dark hair. Smoothly scaled; subterminal line straight, inconspicuous, more or less margined with pale externally, running from costa to internal margin. T. p. line much as in ***cruralis***, a little drawn in submedially, irregular, accented on costa. Discal spot solid; t. a. line thrice waved. Hind wings paler, powdered with fuscous. A mesial line bent and most distinct at anal angle. On both wings, a terminal interrupted line. Beneath paler, with discal dots and distinct mesial line more or less plainly crenulated; subterminal line absent or indistinct. ***Expansion***, 21 to 25 millimetres. Maine (***Mr. Charles Fish***); New York.

This species is the smallest known to me. I have examined four specimens.

DERCOETIS, *n. g.*

The fore wings are deeply excavate to vein 4, so that there is a resemblance to ***Aventia.*** The palpi are disproportionally long stretched straight out, the short, third joint vertical; the elongate second joint as in *Hypena.* Ocelli; eyes naked, unlashed. Legs unarmed, untufted. Male antennæ very shortly pectinate, setose. Fore wings deeply excavate to vein 4; external margin produced at the middle about veins 4 and 3, thence sloping inwardly to internal angle; 12-veined, vein 1 simple, 2 from submedian at basal ⅜, 3 shortly before 4, 5 on a line with 4 from a cross-vein very near 4 at base, cell open, 6 opposite 5 from a cross-vein, 7 and then 8 out of 9, 10 within 6 from the upper side of the vein about midway between 11 and 7. Hind wings rounded, a slight depression opposite the cell; 8-veined, two internal veins counted as 1, 3 and 4 from one point, 5 from a short cross-vein within 3 and 4, cell open. The moth is light purplish-gray; beneath, the abdomen and wings are stained with ochrey and brown. It looks like one of the *Pyralidæ*, but from its structure I refer it to the Deltoids.

DERCETIS VITREA, *n. sp.*

♂.—Fore wings light purplish-gray, a little tinged with ochrey on costa before exterior line. A white discal spot; interior line marked on costa. Exterior line tolerably distinct, lunulate, marked on costa, as is the faint subterminal line. Fore wings darker outwardly, with a more purplish cast. Hind wings grayish-white, crossed by two outer lines; a broken terminal line. Beneath, costal region of primaries ochrey, terminally shaded with brown; the wings are irrorate with brown and ochrey darker than above, lines repeated and the white discal spot on primaries; hind wings with faint dark discal mark. *Expansion*, 25 millimetres. Several specimens, Buffalo, N. Y., in July.

DERCETIS PYGMÆA, *n. sp.*

♀.—Of the same color as the preceding, but less than half the size. The reniform is reddish-ochreous, not white. Inner line faint, oblique, rounded. The angles of the primaries are less pronounced and the palpi less prominent. The insect is very inconspicuous, faded dusty-gray, with obliterate ornamentation. *Expansion*, 14 millimetres. Texas (*Belfrage*, No. 395, July 1).

MAMESTRA CONGERMANA.

Hadena congermana, Morrison, Can. Ent. vi. 106.

I have before me Mr. Morrison's type, and the eyes are distinctly hairy. I cannot see why Mr. Morrison referred the moth to *Hadena*. He says of it (*l. c.*):—"It is another member of the same little closely related group of *Hadena*, of which *dubitans* Walk., and *sputator* Grote, are the only species." This is totally inaccurate, the species being nearest to *Mamestra vindemialis*. Its resemblance to *dubitans* and *sputator* is not greater than that of *vindemialis* Grote, which latter may be the *vindemialis* of Guenée, and the *rubefacta* of Mr. Morrison.

ART. VII.—A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENUS ALPHEUS.

By J. S. Kingsley.

The materials upon which the following paper is based are the collections of the Peabody Academy of Science at Salem, Mass., and of the Peabody Museum of Yale College at New Haven, Conn., which latter were kindly loaned the writer by Prof. S. I. Smith.

ASTACUS (*pars*), Fabricius, Entomologiæ Systematicæ, 1793, ii. 478.

PALÆMON (*pars*), Oliver, Encyclopédie Méthodique, 1811, v. 656.

ALPHEUS, Fabricius, Suppl. Ent. Syst. 1798, 404.—Latreille, Genera Crustacés et Insectorum, 1806, i. 52; *id.* Considérations Générales sur . . . les Crustacés, etc. 1810, 101.—Say, Journal Academy Natural Sciences, Philadelphia, 1818, i. 243.—Bosc, Hist. Nat. des Crustacés, 2e éd. par Desmarest, 1830, ii. 72.—Gray, in Griffith's Cuvier, Crustacea, 1832, 192.—H. Milne-Edwards, Hist. Naturelle des Crustacés, 1837, ii. 349.—Dana, U. S. Exploring Expedition, Crustacea, 1852, i. 534, 541.—Bell, British Stalk-eyed Crustacea, 1853, 270.

BETÆUS, Dana, *op. cit.* i. 534, 548.—Stimpson, Proceedings Acad. Nat. Sciences, Philadelphia, 1860, 31.

The genus *Alpheus*, as limited by the writer, is characterized by having a compressed form, the carapax being extended forward, forming a hood over the eyes, the rostrum either small or wanting; the antennulæ with a two-branched flagellum; antennæ with a large antennal scale. Mandible deeply bifurcate, the anterior branch being oblong, slender; a mandibular palpus present; external maxillipeds are slender, of moderate length; hands of the first pair generally greatly enlarged, unequal, sometimes the right and sometimes the left being the larger in the same species. The second pair are slender, filiform, chelate, the carpus multiarticulate. The remaining feet and the abdomen present no characters of especial importance.

In 1852, Dana characterized the genus *Betæus*, which differs from *Alpheus*, as accepted by him, merely in the absence of a rostrum and the inversion of the hands, the dactylus being borne on the lower edge of the propodus. That the line separating these two genera cannot be drawn is shown by the fact that *Betæus trispinosus* Stm. is rostrated, while in a large series of *Alpheus minus* Say I found many which wanted the rostrum. The hand also cannot be taken as a guide, for we find forms of *Alpheus heterochelis*, in which the dactylus is a little inclined; in my *Alpheus cylindricus*, it works still more obliquely, while in my *Alpheus transverso-dactylus* its motion is in a horizontal plane. Thus the species of *Betæus* described by Dana (*truncatus*, *æquimanus*, *scabrodigitus*), Stimpson (*australis* and *trispinosus*), and Lockington (*longidactylus* and *equimanus*) will have to be placed in the genus *Alpheus*.

Say, in volume 1 of the Journal of the Academy of Natural Sciences, was the first to mention any North American species of this genus, describing *Alpheus heterochelis* and *A. minus*. Milne-Edwards, in his "Histoire Naturelle des Crustacés", t. ii, describes as new *A. armillatus* from the West Indies, and also gives abstracts of Say's descriptions. DeKay, in the "New York Fauna, Crustacea", also gives brief diagnoses of the same two species. Gibbes, in the "Proceedings of the American Association for the Advancement of Sciences", vol. iii, reports *A. heterochelis* and *A. minus* from Florida and Charleston, S. C. He also proposes as new *A. formosus*. Henri de Saussure, in his "Mémoire sur Divers Crustacés Nouveaux du Mexique et des Antilles", redescribes *A. heterochelis* under the specific name *lutarius*. He also refers to a previous article (Revue Zoologique, 1857, 99, 100), where, laboring under a misapprehension, he described it as the type of a new genus, *Halopsyche*. Dr. Stimpson, in a critique of this memoir of Saussure (American Journal of Science, 1859, xxvii. 446), pronounces his *lutarius* to be the *heterochelis* of Say. S. I. Smith ("Transactions of the Connecticut Academy of Arts and Sciences", ii. 39) reports *A. heterochelis* from various localities. Dr. Streets, in the "Proceedings of the Academy of Natural Sciences of Philadelphia", 1871, 242, describes *A. bispinosus* from the Isthmus of Panama, but from which coast I am unable to ascertain. Mr. Lockington, in the "Proceedings of the California Academy of Sciences", February 7, 1876, describes *Alpheus bellimanus*, *A. equidactylus*, and *Betæus longidactylus*, this being the first mention of any species from the Pacific coast. In a later paper (March 20, 1876), he adds *Betæus equimanus* and *Alpheus clamator*. This comprises, so far as I am aware, all the literature of the North American *Alphei*.

ALPHEUS MINUS *Say*.

Alpheus minus Say, Jour. Acad. Nat. Sci. 1818, i. 245.—Edwards, Hist. Nat. des Crustacés, ii. 356.—DeKay, New York Fauna, Crustacea, 26.—Gibbes, Proc. Am. Assoc. Adv. Sci. 1851, 196,

Alpheus formosus Gibbes?, *loc. cit.* 196.

Carapax smooth; rostrum short, acute; a spine arising from the anterior edge of the hood over each eye equalling the rostrum in length, thus giving the front a three-spined appearance. Basal spine of antennulæ slender, acute, incurved, reaching to the middle of the second basal joint; first joint as long as second and third, second a half longer than the third; flagella ciliated, two-thirds the length of the carapax. Basal spine of antennæ long, slender. Antennal scale regularly elliptical, extending slightly beyond the antennular peduncle; flagellum nearly twice as long as the carapax. External maxillipeds slender, extending beyond the peduncle of the antennulæ. Feet of the first pair greatly unequal; larger hand a third longer then carapax, cylindrical, slightly tapering toward the extremity; a strong spine above, and a smaller one near it, at the articulation of the dactylus; thumb short, dactylus longer, about one-half as long as the palm. The carpus viewed from the side is somewhat sigmoid in outline; a strong spine upon the upper margin. Meros triangular, sides flat; distal portion of upper margin prolonged into a spine. Smaller hand somewhat similar to the larger; the fingers, however, being equal, slender, and proportionately longer than in the larger hand; carpus and meros smaller than on the other side, and somewhat compressed. Ischium and meros of second pair compressed; carpus five-jointed, first joint equalling the other four in length; second, third, and fourth subequal; fifth slightly longer. Feet of the last three pairs compressed; propodus spinulose on the inferior margin; dactylus biungulate. Telson tapering; extremity rounded.

The majority of specimens of this species that I have seen are quite small, averaging 11.5^{mm} in length. A larger specimen, from Fort Jefferson, Florida, gave the following measurements:—Length of body, 26.3^{mm}; carapax, 10.3^{mm}; basal scale of antennæ, 3.8^{mm}; larger hand, 13.3^{mm}. In a large series of this species, I find the shape of the larger hand as constant as any other character. In some specimens, the ocular spines are present, while the rostrum is wanting; in others, the front is truncate, no spines being present. The proportions of the joints of the carpus of the second pair also vary. While in the majority of the specimens examined they are as given above, in others the first is scarcely longer than the two succeeding. I have examined specimens of this species from Fort Macon, N. C. (*Dr. H. C. Yarrow*), Charleston, S. C., Key West, Fla. (*A. S. Packard, jr.*), Nassau, N. P. A single specimen was sent me from Yale, bearing the label "Bermudas, G. B. Goode", and identified as *Alpheus formosus* Gibbes. It agrees well with Gibbes's description quoted above; but as far as I can see there is nothing to separate it from *A. minus*. The relative lengths of rostrum and ocular spines can be of no great importance when they vary as I have shown. Specimens in the museum of Yale College, from "Pearl Is., Bay of Panama, F. H. Bradley", I cannot separate from Floridan examples. The spines on the front are more acute, and the rostrum somewhat longer than in east-coast specimens. The antennular spines also are not incurved. Other than these, I can detect no important points of difference.

The only other species of *Decapoda* that I know of as being reported from both coasts are:—

Microphrys weddillii Edw. (*fide* A. Edw.).
Hyas coarctatus Leach (*fide* Stm. Jour. Bost. Soc. Nat. Hist. vi. 450).
Acanthonyx petiveri Edw. (*fide* Stm. Ann. N. Y. Lyc. 97).
Domecia hispida Souleyet (*fide* Stm. Ann. Lyc. vii. 218).
Eriphia gonagra Edw. (*fide* Stm. Ann. Lyc. vii. 217).
Achelous spinimanus De Haan (*fide* A. Edw.).
Cronius ruber Stm. (*fide* Stm. Ann. Lyc. vii. 225).
Carcinus mænas Leach. (Prof. S. I. Smith in letters reports this as collected by F. H. Bradley at Panama.)

Uca una Latr. (*fide* A. Edw.).

Nautilograpsus minutus Edw. (*fide* Stm. Ann. Lyc. vii. 231).

? *Acanthopus planissimus* Dana (*vid.* Stm. Ann. Lyc. vii. 232).

? *Aratus pisoni* Edw. (*vid.* Smith, Rep. Peabody Acad. Sci. 1871, 92).

? *Goniopsis cruentatus* De Haan (*vid.* Smith, *l. c.* 92).

Petrolisthes armatus Stm. (*fide* Stm. Ann. Lyc. vii. 73).

Eupagurus bernhardus Brandt (*fide* Stm. Jour. Bost. Soc. Nat. Hist. vi. 483).

Eupagurus kroyeri Stm. (*fide* Stm. Ann. Lyc. vii. 89).

Crangon boreas Fabr. (*fide* Stm. Proc. Acad. Nat. Sci. Phila. 1860, 25).

Sabinea septemcarinata Owen (*fide* Stm. Proc. Phil. Acad. 1860, 26).

Nectocrangon lar Brandt (*fide* Stm. Proc. Phila. Acad. 1860, 25).

Hippolyte spina White (*fide* Stm. Proc. Phila. Acad. 1860, 34).

Hippolyte grönlandica (J. O. Fabr. sp.) Miers [*H. aculeata* Edw.] (*fide* Stm. Proc. Phila. Acad. 1860, 33).

Pandalus borealis Kroyer (*fide* Stm. Jour. Bost. Soc. vi. 501).

Palæmon jamaicensis Oliv. (*fide* Smith, *l. c.* 97).

To this list I would add :—

Alpheus minus Say.

Alpheus heterochelis Say.

Alpheus transverso-dactylus Kingsley.

ALPHEUS PANAMENSIS *Kingsley.*

Near *Alpheus minus* Say. Body very compressed; carapax smooth; rostrum short, separated from the ocular arches by a deep sulcus; the orbital spines arising not from the anterior edge of the carapax, as in *A. minus*, but from the superior surface, the margin being continuous beneath the spines; these spines do not extend so far forward as in the Floridan analogue. Basal spines of antennulæ extending slightly beyond first joint; third joint somewhat shorter than the second. Basal joint of antennæ with a spine beneath; antennal scale extending slightly beyond the peduncles of antennulæ; flagellum nearly as long as the body. External maxillipeds reacting to tip of antennal scale. Hands of the first pair not so disproportionate as in *A. minus;* the larger is smooth, compressed, with the margins entire; dactylus two-fifths the length of the propodus, extending slightly beyond the thumb, with a tooth on the occludent margin shutting into a cavity of the thumb, as in *A. minus* and *A. heterochelis.* The fingers are slightly curved outward, and are somewhat hairy. The smaller hand is nearly as long as, but more slender than, the larger dactylus, slender, half as long as propodus, trigonal, the occludent side being furnished with a ridge, which shuts into a groove in the thumb; the points of the fingers are curved and overlapping. Feet of the second pair short; carpus five-jointed; the first joint as long as the two following; second and fifth subequal, each a half longer than the third or fourth, which are also subequal. Propodal joints of following pairs spinulose beneath. Telson triangular, truncate.

Acajutla, Central America, and Panama (*F. H. Bradley*). Three specimens from the latter locality give the following measurements:—

Length of body.	Carapax.	Larger hand.
29.0mm	8.5mm	12.0mm
27.8	8.0	16.3
32.0	10.0	15.0

ALPHEUS SULCATUS *Kingsley.*

Carapax smooth; rostrum short, extending very slightly beyond the vaults over the eyes, which are produced forward, though they can scarcely be called spiniform; sides of the rostrum with long hairs. Basal spine of antennulæ reaching to the second joint; third joint the shortest. Inner branch of flagella a third longer than the carapax; outer about half as long as inner. A small spine on the basal joint of antennæ beneath; antennal scale equalling antennular peduncle, regularly tapering; flagellum nearly as long as the body. External maxillipeds slender, extending beyond antennal scale, the distal joint being ciliated. Meros of larger cheliped triangular; no spine above; hand ovate-compressed, with a few scattered hairs; a slight sulcus on the upper margin of the palm; a furrow on the outer, and a similar one on the inner surface of the hand, running back from the articulation of the dactylus to about the middle of the palm; a slight constriction on the under margin; thumb distorted, a furrow on the outer surface parallel with the occludent margin; dactylus about a third as long as propodus, extending beyond the thumb; a tooth on the inner margin, as in *A. heterochelis.* Carpus of the second pair five-jointed; first joint as long as the next two; second a half longer than third; third and fourth equal; fifth as long as second. Telson tapering-truncate.

Of this form I have seen but two imperfect specimens; one from the Bay of Panama, and the other from Zorritas, Peru (*F. H. Bradley*), which give respectively the following measurements:—

Length of body.	Carapax.	Larger hand.
35.0mm	11.8mm	15.5mm
23.3	8.0	10.3

ALPHEUS FLORIDANUS *Kingsley.*

Carapax smooth, somewhat compressed; rostrum short, acute, the carina running back nearly to the middle of the carapax. Basal spine of antennulæ extending but slightly beyond the rostrum. Second joint of antennular peduncle three times as long as the last joint; outer branch of flagella stout, a little longer than the peduncle; inner branch slender, twice as long as the outer. Antennal scale as long as peduncle of inner antennæ, and shaped as in *A. heterochelis;* flagellum a half longer than the body. Meros of first pair trigonal, the inner inferior edge bearing small spines. Hands unequal, the larger compressed, one and a half times as long as the carapax; fingers equal, pointed, completely closing, occupying about two-fifths the length of the hand.

Smaller hand slightly compressed, as long as larger; fingers longer than palm, the thumb being longer than the dactylus; both very slender, not completely closing, and fringed with long hairs. Ischium of second pair longer than the meros; carpus five-jointed, first joint a little shorter than the second, the last three subequal and together as long as the second. Three posterior pairs without spines on the meral joints; propodi hirsute; dactyli lamellate. Telson tapering, twice as long as broad; the apex obtusely pointed.

Length of body.	Carapax.	Hand.
29.5mm	9.3mm	15.5mm

Fort Jefferson, Florida (*Lieutenant Jacques, U. S. N.*).

ALPHEUS HETEROCHELIS *Say*.

Alpheus heterochelis Say, *l. c.* i. 243.—Edwards, *op. cit.* 356.—DeKay, *op. cit.* 26.—Gibbes, *l. c.* 196.—Smith, Trans. Conn. Acad. ii. 23, 39.
Alpheus armillatus, Edwards, *op. cit.* ii. 354.
Alpheus lutarius Saussure, Crustacés Nouv. des Antilles et du Mexique, 45, pl. iii. f. 24.—v. Martens, Wiegmann's Archiv für Naturgeschichte, 1872, 139.
Halopsyche lutaria Saussure, Revue Zoologique, 1857, 100 (*teste* Saussure).

Carapax smooth; rostrum short, acute, depressed; ocular arches without spines. Basal spine of antennulæ stout, short, not reaching base of second joint; second joint more than twice as long as third. Outer flagellum half as long as inner. Antennal scale as long as antennular peduncle, the spine on the anterior lateral margin large, stout, acute; inner margin arcuate, widening toward the base; flagellum somewhat longer than the body. Feet of the first pair unequal; meros joint triangular; carpus as broad as long. Larger hand one and a half times as long as carapax, compressed, margins rounded; a constriction of the upper and under margins at about the middle. Thumb three-fourths as long as palmar portion, a strong rectangular tooth on inner portion of occludent margin; apex acute. Dactylus with a process on the inner margin, which shuts into a cavity in the opposing thumb; points of fingers overlapping. The smaller hand cylindrical, the constrictions but faintly indicated; fingers three-fourths as long as palm. Dactylus flattened; occludent margin with a longitudinal carina, shutting into a groove in the thumb, the fingers with a fringe of hairs. Feet of the second pair slender, filiform; ischium and meros equal; carpus five-jointed, first joint as long as second and third, second as fourth and fifth, third and fourth equal, fifth a half longer than preceding. Telson subquadrate; extremity arcuate.

The variations I have observed from the above description are as follows:—In specimens from Florida, I have found the front three-spined, the ocular spines, however, being smaller than the rostrum. In a specimen from Nassau, N. P., there is a groove upon the upper margin of the propodus of the larger hand, which at about a median point between the base and the articulation of the dactylus bends and is continued for a short distance upon the outer surface. The dactylus is also somewhat obliquely articulated.

Three specimens from Florida give the following measurements:—

Length of body.	Carapax.	Larger hand.
30.3mm	11.2mm	17.6mm
29.6	10.8	15.3
32.5	13.8	15.0

Specimens from Lake Harney, Florida (which is, I am informed by Prof. J. W. P. Jenks, a body of fresh water), are greatly larger than the average:—

Length of body.	Carapax.	Larger hand.
43.7mm	15.0mm	20.5mm
42.0	15.6	25.0

I have examined specimens from Fort Macon, N. C. (*Dr. H. C. Yarrow*); Smyrna and Key West, Fla. (*A. S. Packard, jr.*); Bahamas, Bermudas (*G. B. Goode*); Aspinwall (*J. A. McNiel*); Abrolhos, Brazil (*C. F. Hartt*). Specimens brought from Panama by *F. H. Bradley* and from Realigo, west coast of Nicaragua, by *J. A. McNiel*, appear to be the same as the east-coast form. In the Proceedings of the California Academy of Sciences for February 7, 1876, Mr. Lockington describes *Alpheus equidactylus*, the characters of which agree, so far as they go, perfectly with this species; but, owing to the imperfections of his description, I am unable to decide whether they are the same.

ALPHEUS AFFINIS *Kingsley*.

Carapax rather broad, smooth; rostrum acute, separated from the ocular arches by a sulcus; ocular arches produced forward; peduncles of antennulæ hirsute; basal spine extending to second joint; joints of peduncle as in *heterochelis*. Basal joint of antennæ with spine beneath; basal scale narrower than in *heterochelis*, extending as far forward as peduncle of antennulæ; flagellum as long as body. External maxillipeds hirsute, extending to extremity of basal scale. Meros of first pair triangular; spines on the inner inferior margin. Larger cheliped quite compressed; a constriction on the upper margin, the posterior edge of which extends forward as a spine; a sulcus runs back from this constriction on both the inner and outer surface to behind the middle of the palm; lower margin compressed opposite the constriction in the upper. Dactylus as in *heterochelis*, but obtuse. Smaller hand as in *heterochelis*, but more slender. Carpus of second pair five-jointed; first and second equal, and each as long as the three remaining; third and fourth equal, and each slightly shorter than fifth. Telson slightly tapering; extremity rounded. Panama (*F. H. Bradley*). Seven specimens.

ALPHEUS PARVIMANUS *Kingsley*.

Slender, compressed; rostrum short, acute; basal spine of antennulæ not reaching second joint; basal joints nearly equal, the third being slightly shorter than the second. Basal joint of antennæ with a minute spine beneath. Antennal scale narrow, reaching slightly beyond antennular peduncle, the spine at the antero-lateral angle reaching beyond the laminate portion, which is small. External maxillipeds slender, extending to the extremity of the antennal scale, the distal portion with long hairs. Meros of first pair rounded-triangular. Hands small, nearly equal; the larger oblong, compressed, smooth, with scattered hairs; a constriction of both margins posterior to the articulation of the dactylus; fingers completely closing; dactylus acute, shutting into a groove in the propodus, as in the case of *A. heterochelis*, the tooth of the inner margin being, however, much less prominent. Smaller hand slender, nearly cylindrical, hirsute, the fingers as long as the palm. Carpus of the second pair five-jointed; first joint as long as the three following, second as long as fourth and fifth, third and fourth equal, and together equalling the last. Meros of posterior pairs without spines beneath. Extremity of telson rounded. Panama (*F. H. Bradley*). Four specimens.

ALPHEUS CYLINDRICUS *Kingsley*.

Carapax smooth; rostrum very short, obtuse; no orbital spine; first and third joints of antennulæ equal, second twice as long. Flagella of antennulæ and antennæ broken. No spine on basal joint of antennæ. Antennal scale slender, narrow, pointed, the laminate portion being almost obsolete, extending to extremity of second joint of peduncle of antennulæ. External maxillipeds long, extending beyond peduncle of antennæ. Meros of the first pair short, stout, triangular. Larger hand cylindrical, a groove on the outer side below the articulation of the dactylus. Dactylus working horizontally, very short, yet extending beyond the opposable part, two or three teeth on the inner margin, and shutting into a groove in the propodus. Smaller hand cylindrical; fingers as long as palm, equal, slender, curved downward. Carpus of second pair jointed; first joint equalling the following three; second as long as third and fourth, which are equal; fifth a half longer than fourth. Telson narrow, tapering rapidly; extremity truncate.

Length of body.	Carapax.	Larger propodus.	Dactylus.
19.5mm	8.0mm	12.0mm	3.0mm

Pearl Island, Bay of Panama (*F. H. Bradley*). One specimen.

ALPHEUS TRANSVERSO-DACTYLUS *Kingsley*.

Compressed carapax, minutely punctate; front three-spined; basal spine of antennulæ not extending to the second joint of the peduncle; second joint twice as long as the third; inferior branch of flagella twice as long as the superior. Basal joint of antennæ with a spine; antennal scale very narrow, terminating in a strong spine; flagella nearly as long as the body. External maxillipeds extending to the tip of the antennal scale; basal joints with scattered hairs; distal joints thickly covered. Feet of the first pair large, unequal; larger hand with the outer proximal portion smooth; at about the middle there is a constriction of both margins, connected on the inner surface by a more or less apparent groove. Slightly in advance of these constrictions, the surface is abruptly compressed, two elevated lines running out from the basal portion, the lower terminating in a spine; a spine above the articulation of the dactylus; dactylus articulated to the outer surface of the hand, working horizontally, extending beyond the thumb, fitting for about half its length in a groove in the propodus; dactylus and distal portion of propodus with long hairs. Smaller hand about half the size of the larger, constricted above and below; a spine above the articulation of the dactylus; dactylus articulated in the usual manner, working vertically; inner surface of hand somewhat hairy. Carpus of the second pair five-jointed, first and second joints subequal, and each as long as the fourth and fifth together; third and fourth subequal; fifth slightly longer. Meral joints of the remaining pairs with a spine beneath; propodi spinulose. Telson tapering; extremity rounded.

Length of body.	Carapax.	Larger hand.
21.5^{mm}	7.7^{mm}	10.2^{mm}
14.0	5.1	8.8

Santa Barbara and San Diego, Cal. (*W. G. W. Harford*), seven specimens. I cannot separate from this two specimens from the Bermudas, one collected by *J. M. Jones* and the other by *G. Brown Goode.*

ALPHEUS CLAMATOR *Lockington.*

Alpheus clamator Lockington, Proceedings California Academy of Science, March 20, 1876.

The following description is drawn from a single imperfect specimen in the museum of the Peabody Academy of Science, which I refer to this species.

Basal spine of antennulæ stout, short, not reaching second joint of peduncle; third joint half as long as preceding. Antennæ without spine on the basal joint. Antennal scale narrow, the spine at the antero-exterior angle acute, slender, reaching the end of the antennular peduncle. External maxillipeds rather broad, extending slightly beyond the antennal scale. Feet of the first pair unequal. Meros smooth, with a very slender spine on the distal portion above. Larger hand compressed, a constriction of each margin at about the middle, a spine above the articulation of the dactylus, behind which a sulcus runs obliquely across the superior margin. A second spine on the outside; thumb slender; dactylus compressed, semicircular in outline viewed from the side, slightly longer than the thumb. Smaller hand with both margins constricted; upper margin of palm tuberculate; a spine above the articulation of the dactylus; fingers about equal to the palm, completely closing. Ischium and meros of second pair equal; carpus five-jointed, first two joints equal, and each as long as the third and fourth, which are also equal; fifth joint nearly as long as the first. Meros joints of posterior pairs without spines; propodal joints spinulose beneath; dactyli slender. Santa Barbara, Cal. (*W. G. W. Harford*).

From the description of Mr. Lockington, I get the following additional characters, not afforded by my imperfect specimen:—Front three-spined; the rostrum slender, longer than, and separated from, the ocular spines by a deep sulcus. Flagella of antennulæ about half as long and of antennæ three-fourths as long as the body.

ALPHEUS LONGIDACTYLUS *Kingsley.*

Betæus longidactylus, Lockington, *l. c.* Feb. 7, 1876.

Compressed; carapax smooth; front rounded; rostrum and ocular spines wanting; antennular spines slender, acute. First and second antennular joints subequal, third shorter; inner flagellum three-fourths the length of carapax, outter ? Antennal scales shorter than peduncles of either pair of antennæ. External maxillipeds extending nearly to extremity of antennal peduncle. Hands of the first pair equal, slender, inversed; dactylus slightly longer than palm, with a few teeth on the dactylus at the base. Pincer gaping, a single tooth on the thumb near the palm; fingers both pointed. Carpus of second pair five-jointed; first joint as long as the three following; second, third, and fourth equal; fifth slightly longer. Extremity of telson rounded.

Length of body.	Of carapax.	Of hand.
35.0mm	12.0mm	. . .
. . .	8.0	7.0mm

San Diego, Cal. (*Henry Hemphill*); two dry, imperfect specimens.

ALPHEUS HARFORDI *Kingsley.*

Carapax smooth; rostrum wanting, the front being emarginate between the eyes. Basal scale of antennulæ spiniform, very long and slender, extending forward as far as the middle of second joint and slightly incurved. Second joint of peduncle three times as long as last joint. Outer branch of flagellum about one-half and inner about two-thirds the length of carapax. Antennæ without a spine on the basal joint; antennal scale with the spine long and slender, the laminate portion being quite small. Flagellum about two-thirds the length of body. Meros of first pair trigonal, with a small spine at upper distal angle. Larger chela compressed-ovate, smooth, without corrugations or constrictions; pollex with a notch furnished with two or three small teeth near the articulation of the dactylus; dactylus slender, extending beyond the opposite finger, a notch similar and opposite to that on the thumb; the dactylus is articulated to the inferior margin of the propodus. Smaller hand not greatly differing from the larger, but more slender, and the fingers without any notch. Feet of second pair slender; ischium slightly shorter than meros; carpus five-jointed, the first as long as the three succeeding ones; second, third, and fourth equal; the fifth slightly longer; chela about as long as the two preceding joints. Telson slender, tapering; extremity regularly rounded.

This species differs from the description of *Betæus equimanus* Lockington in having the peduncles of antennæ and antennulæ nearly equal, the relative lengths of the antennular flagella, and the shape of the fingers of the larger hand, which are not straight on the occludent margin.

Santa Barbara, Cal. (*W. G. W. Harford*), 4 specimens. Catalina Island, Cal. (*W. G. W. Harford*), 3 specimens; under the mouth of *Haliotis rufescens* Swains.

Length of body.	Carapax.	Larger hand.	Larger dactylus.
24.0mm	8.0mm	8.0mm	4.7mm
19.0	6.0	6.0	3.6

Of the following species I have not seen specimens:—

Alpheus bellimanus, Lockington, *l. c.* Feb. 7, 1876.

This appears to be near the *transversus* of this paper. Lockington's specimens came from San Diego, Cal.

Alpheus equidactylus, Lockington, *l. c.* Feb. 7, 1876.

From Monterey, Cal. The extremely short description applies perfectly to *A. heterochelis*.

Alpheus bispinosus, Streets, Proc. Phila. Acad. Nat. Sci. 1872, 242.

The description applies very well to *A. heterochelis*. The specimens came from the Isthmus of Panama, but from which coast is not known.

ALPHEUS ÆQUALIS *Kingsley*.

Betæus equimanus (nom. præoc.), Lockington, *l. c.* Mar. 20, 1876.

Appears to be near the *Alpheus harfordi* described above. If it prove distinct, it will stand as *æqualis*, as the name *equimanus* has been used by Dana.

PEABODY ACADEMY OF SCIENCE,
Salem, Mass., November 5, 1877.

ART. VIII.—NOTES ON THE MAMMALS OF FORT SISSETON, DAKOTA.

BY C. E. MCCHESNEY, M. D.,
Acting Assistant Surgeon, U. S. A.
Annotated by DR. ELLIOTT COUES, U. S. A.

[The following paper was prepared by Dr. McChesney as a contribution of material to my forthcoming History of North American Mammals. Representing as it does much valuable and interesting information from original observations, it is published intact, in advance of its incorporation in substance in my work. In making my acknowledgments to the author for his cordial and well-considered collaboration, I would especially call attention to his dissections of the peculiar pouches of the *Geomyidæ*, supposed not to have hitherto been examined anatomically, as well as to the many reliable measurements of fresh specimens, which increase the value of the preparations with which he has favored me.

The collection has been deposited, in accordance with Dr. McChesney's wish, in the National Museum of the Smithsonian Institution, excepting a number of specimens intended for osteological preparations, which have been placed, likewise by Dr. McChesney's desire, in the Army Medical Museum.

I have myself confirmed the author's identifications in nearly all cases. My annotations are bracketed, with my initials.—E. C.]

FELIDÆ.

LYNX CANADENSIS, (*Geoff.*) *Raf.*

The Canada Lynx, I am informed on what I believe to be reliable authority, was a few years ago not uncommon on the "Coteau des Prairies", and even within a year past one or two animals believed to belong to this species have been seen; but no specimen has been secured by me.

CANIDÆ.

CANIS LATRANS, *Say.*

The Prairie Wolf, or Coyote, is found in this vicinity in very limited numbers, and is the only representative of the genus *Canis*, with the exception of *C. familiaris*, which forms an important part of this, much the same as in other frontier military garrisons.

VULPES VULGARIS PENNSYLVANICUS, (*Bodd.*) *Coues.*

The American Red Fox is trapped in this vicinity by Indians, but is not very abundant. The special state of semi-melanism occurring in this animal, and constituting var. *decussatus*, or the Cross Fox, is seen to some extent here.

PUTORIUS ERMINEA, (*Linn.*) *Cuv.*

The White Weasel, or Ermine, is found here in small numbers. Specimens in winter dress show considerable sulphur-yellow on the tail and hind feet.

PUTORIUS LONGICAUDA, *Rich.*

The Long-tailed Ermine is not common in this vicinity. Two specimens only have been secured, the measurements of which are as follows:—

	No. 173, ♂.	No. 176, ♀.
From tip of nose to eye	0.82	0.80
From tip of nose to ear	1.65	1.53
From tip of nose to occiput	2.51	2.28
From tip of nose to tail	10.10	10.20
Tail to end of vertebræ	7.00	5.90
Length of fore feet	1.62	1.39
Length of hind feet	1.91	1.80
Width of palms	0 53	0.47

PUTORIUS VISON, *Rich.*

The Mink is common, as is attested by the number of skins offered for trade by the Indians, in this vicinity.

TAXIDEA AMERICANA, (*Bodd.*) *Baird.*

The American Badger is found here in small numbers. Like other fur-bearing animals, it is hunted by the Indians for purposes of trade, and the flesh is often used by them as food.

MEPHITIS MEPHITICA, (*Shaw*) *Baird.*

The generally abused American Skunk is common on the "Coteau des Prairies". The fact is that the Skunk is not nearly as bad an animal as most people would have us believe. In his way, which may be humble, he is capable of, and does, much good. He is insectivorous to a remarkable degree, consuming vast quantities of insects that are injurious to vegetation. Instances of his kindness might be cited in proof of his often genial disposition, and he only follows the coarser instincts of his nature when molested, and for this surely the animal is not to blame; but under such circumstances, I must confess I prefer to admire him at that safe distance which "lends enchantment to the view".

URSIDÆ.

URSUS AMERICANUS, *Pall.*

The Black Bear was once of very common occurrence in this vicinity. None have been seen of late years within fifty or sixty miles of this post. It has disappeared probably in consequence of being persistently pursued by the Indians.

PROCYONIDÆ.

PROCYON LOTOR, (*Linn.*) *Storr.*

The Common Raccoon is not now found in this vicinity. A few years ago it was not uncommon to find it on the slopes of the Coteau.

BOVIDÆ.

BISON AMERICANUS, (*Gm.*) *H. Smith.*

The American Buffalo was a few years ago numerous on the "Coteau des Prairies"; none, however, have been seen here since 1868. The bones of many may be seen at the present day scattered over the prairie. The steady advances of civilization have forced the Buffalo, in common with all the large mammals, from this locality, and into comparatively narrow limits, where, unless protection is extended, it must ere long be numbered with the animals of the past.

ANTILOCAPRIDÆ.

ANTILOCAPRA AMERICANA, *Ord.*

The Prong-horn Antelope was formerly very abundant, but is now rarely seen here. Occasionally we hear of this animal having been seen on the western slope of the Coteau, having doubtless come from the valley of the James River, about thirty-five miles from the post.

CERVIDÆ.

CARIACUS MACROTIS, (*Say*) *Gray.*

The Mule or Black-tailed Deer is not now found on the Coteau to my knowledge. The last I have heard of being killed in this vicinity occurred three years ago at Clear Lake, about ten miles from the post.

CARIACUS VIRGINIANUS, (*Bodd.*) *Gray.*

The White-tailed Deer was some ten years ago very common in this vicinity; none have been seen for several years past.

VESPERTILIONIDÆ.

One or more species of the ordinary Bats are certainly represented here, but no specimens have been procured, and I do not therefore desire to commit myself to any determination of species.

SORICIDÆ.*

[?] SOREX COOPERI, *Bach.*

I believe that Cooper's Shrew is moderately abundant in this locality; but as specimens of this genus are very difficult of identification, those I have collected have been submitted to Dr. Coues for determination.

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*[I have been unable to find time to give Dr. McChesney's *Soricidæ* the critical attention they require, and these identifications must be considered provisional. Besides the two species presented, the collection contains *Neosorex palustris*, received since this paper was prepared.—E. C.]

The measurements of the specimens collected, and believed to be referable to *S. cooperi*, are as follows:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—	
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.
67	....	Fort Wadsworth, Dak.........	Aug. 21, 1876	0.41	0.80	0.94	2.75	1.83	0.31	0.50
78	♂	Fort Sisseton, Dak.............	Sept. 23, 1876	0.32	0.68	0.82	2.16	1.75	0.22	0.43
81	♀	......do........................	Sept. 26, 1876	0.45	0.67	0.97	3.00	2.15	0.40	0.63
82	♀	......do........................	.....do	0.45	0.72	0.93	2.80	1.87	0.40	0.62
83	♀	......do........................	.....do	0.45	0.67	0.91	2.70	1.87	0.40	0.66
85	♂	......do........................	Sept. 27, 1876	0.34	0.56	0.80	2.10	1.70	0.24	0.45
86	♂	......do........................	.... do	0.26	0.46	0.71	2.10	1.50	0.25	0.37
87	♀	......do........................	.....do	0.33	0.58	0.80	2.00	1.60	0.20	0.29
91	♂	......do........................	Oct. 4, 1876	0.32	0.59	0.77	2.10	1.90	0.26	0.45
93	♀	......do........................	Oct. 7, 1876	0.28	0.50	0.78	2.00	1.75	0.26	0.44
106	♂	......do........................	Jan. 29, 1877	0.31	0.67	0.77	1.95	1.60	0.30	0.44
119	♀	......do........................	Apr. 11, 1877	0.27	0.67	0.80	2.25	1.50	0.30	0.45

BLARINA BREVICAUDA, (*Say*) *Bd.*

The Short-tailed Shrew is not abundant, but, where found in this vicinity, appears to have a preference for cultivated fields.

The measurements of specimens taken are as follows:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.	
92	♀	Fort Sisseton, Dak	Oct. 7, 1876	0.54	0.95	1.30	4.50	1.25	0.49	0.65	0.23
99	♀	......do	Nov. 3, 1876	0.56	0.99	1.34	3.90	1.35	0.48	0.63	0.23
121	♂	......do	Apr. 12, 1877	0.45	0.82	1.14	4.20	1.60	0.36	0.66	......

ZAPODIDÆ.

ZAPUS HUDSONIUS, (*Zimm.*) *Coues.*

The Jumping Mouse is found on the "Coteau des Prairies", but, much as elsewhere, is not numerous.

Measurements of specimens.

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Height of ears.	Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
35	♀	Fort Wadsworth, Dak.	July 5, 1876	0.37	0.84	1.00	3.50	4.75	0.32	0.95	......	....
65	....	....do	Aug. 17, 1876	0.44	0.82	1.05	3.55	4.75	0.32	1.00	0.46	....
66	♂	...do	Aug. 18, 1876	0.40	0.75	0.98	3.55	5.10	0.39	1.05	0.42	..
174	♂	Fort Sisseton, Dak.	May 23, 1877	0.45	0.88	0.95	3.25	4.93	0.42	1.05	0.42	0.17

MURIDÆ.

MUS MUSCULUS, *Linn.*

That the common House Mouse has successfully made his way to this part of the world is sufficiently well attested by the number now found here.

Specimens taken do not present any appreciable variations either of size or color from those taken elsewhere.

Genus HESPEROMYS.

HESPEROMYS LEUCOPUS SONORIENSIS, (*LeC.*) *Coues.*

This variety of the Deer or White-footed Mouse is found all over the prairie in this vicinity, and, under favorable circumstances, replaces the common House Mouse.

I have observed this Mouse breeding in the early part of May and also in August. Three to seven usually constitute the litter as observed here.

The following measurements are those of a few of the specimens preserved.

[Judging from the measurements, I suppose true *leucopus* to be included in the list.—E. C.]

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Height of ears.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.	
48	♂	Fort Wadsworth, Dak..	July 19, 1876	0.40	0.70	0.99	3.75	3.43	......	......	......
49	♂	......do..............	July 20, 1876	0.45	0.86	1.04	3.25	3.25	......	......	......
51	♂	......do..............	July 24, 1876	0.50	0.88	1.07	3.75	2.15	.....	......	......
52	♂	......do..............	July 9, 1876	0.44	0.80	0.91	3.00	1.98	......	......	......
69	♂	......do..............	Aug. 25, 1876	0.50	0.81	1.05	3.27	2.23	0.31	0.63	0.59
72	♂	......do..............	Sept. 3, 1876	0.46	0.83	1.07	3.35	2.25	0.36	0.70	0.47
73	♂	......do..............	.....do......	0.48	0.80	1.00	3.15	2.25	0.33	0.73	0.53
74	♂	......do..............	Sept. 14, 1876	0.43	0.83	1.04	3.00	2.20	0.32	0.72	0.50
75	♂	......do..............	.....do......	0.45	0.85	1.05	3.40	2.20	0.32	0.70	0.50
77	♂	......do..............	Sept. 23, 1876	0.46	0.82	1.06	3.00	2.40	0.33	0.68	0.51
80	♂	Sisseton, Dak	Sept. 25, 1876	0.4	0.87	1.06	3.25	2.50	0.30	0.93	0.51
90	♂	......do..............	Oct. 4, 1876	0.50	0.81	1.02	3.10	2.60	0.20	0.61	0.51

HESPEROMYS (ONYCHOMYS) LEUCOGASTER, (*Maxim.*) *Baird.*

The Missouri Mouse is moderately abundant in this vicinity. I have, however, thus far had but little success in trapping it; most of the specimens secured have been taken by judiciously trained cats, sensible enough in the majority of cases not to mutilate their victims. Ten of these Mice have been so captured, seven of which have been preserved, and three were found to be too badly damaged to serve any useful purpose. Of late, I have succeeded in capturing this mouse by use of the "eagle's claw" trap.

On the eastern slope of the small plateau on which the post is situated are several old "shacks", constructed one-half or two-thirds underground, and inhabited by Indians; it is in and about these caves that the Missouri Mouse has been taken. What special attraction there may be in this particular locality to account for this Mouse selecting it as a residence I am unable to say; but it is certain that it has been secured nowhere else here. The location, to be sure, is favorable as regards water and food, but not more so in this respect than many other places in the immediate vicinity of the post.

At Fort Berthold, Dakota Territory, on the Missouri River, where I resided during the greater part of the years 1872 and 1873, this Mouse is very abundant. The Indians of that agency (Arickarees, Gros Ventres, and Mandans) are united by the bond of hatred against the Sioux, and were during these and many former years in an almost constant state of war. In the incursions of the Sioux, many attemps have been made to destroy the united village of the three tribes by fire, and one attempt (in 1863) was partially successful. The three tribes found it necessary, in consequence, to have some secure store-house for their produce, and finally adopted the *cache* method. The *caches* of these Indians, of which there are one or more to each lodge, are dug with great care, and resemble in shape a funnel inverted, and have a capacity of about seventy-five bushels. The opening, which would correspond with the small end of the funnel, is carefully covered, first with boards, then hay, and finally with earth, the latter of which is carefully trodden down, raked over, and in a day or two all trace of the opening is obliterated. Sometimes these *caches* are dug under the lodge of the owner, but much more frequently on the outside of the village, and the exact place is known to the owners only, and by means of alignment with permanent landmarks. In these *caches*, which the Sioux have never yet succeeded in finding, are stored their supplies of corn, beans, squash, and, of late years, potatoes; and in them the Missouri Mouse takes up his abode; and it is no uncommon thing for three or four to be killed at each opening of the *cache*, which seldom occurs more than three times in each year.

I have observed that the Missouri Mouse breeds here early in May and August, and I believe but two litters are brought forth each year. Lactation extends over a period of three weeks, at the end of which time the young are fully able to care for themselves.

Description of specimen No. 204, *collection of Dr. Chas. E. McChesney.*

This is a mature female specimen of large size, as will be seen by the measurements given below.

Upper parts light gray throughout; under parts white. Fore legs as under parts; on the outer part of hind legs the gray of the upper parts extends the entire length of the femur. Inside of hind legs same as under parts.

Tail beneath white, above but little darker, sparsely haired to the very tip. It will be noticed that the tail is short as compared with that of *H. leucopus*.

Ears well developed, sparsely haired inside and outside for about one-third of their height; the hairs of the outer portion nearest the head are black-tipped.

Eyes well developed, and set in a definite black area, which extends entirely around the eye as a narrow border, the same as seen in *H. leucopus*.

Teats: I can discover but three pairs in this specimen, two inguinal and one pectoral.

Fore feet: middle toe longest; first and third of equal length and but little shorter; fourth toe reaching but little beyond base of the third; thumb rudimentary, and with more of a nail than a claw. Five tubercles; one at the base of the inner and one at the base of the outer toes; one at the base of the second and third toes; one back of the one at base of the thumb; and one behind the tubercle at base of the outer toe, the last two being aligned.

Hind foot: but four tubercles are here discoverable; the one back of the tubercle at base of the outer toe is wanting.

Whiskers: arranged in five parallel rows, the three inner ones of which are black throughout; the two outer rows are white for their entire length. Longest hairs are 1.28 in length.

Head and forehead are a trifle darker gray than the back. Nose a little lighter than head. Chin white.

The specimen measures as follows:—

From tip of nose to eye	0.53
From tip of nose to ear	1.16
From tip of nose to occiput	1.40
From tip of nose to tail	4.80
Tail to end of vertebræ	1.80
Length of fore foot	0.56
Length of hind foot	0.85
Length of longest fore claw	0.16
Width of palms	0.22
Height of ears	0.48
Longest hairs	1.28

Specimen taken at Fort Sisseton, Dakota Territory, August 25, 1877.

Measurements of specimens.

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Height of ears.	Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
70	......	Fort Wadsworth, Dak.	Aug. 30, 1876	0.57	1.04	1.23	4.00	1.67	0.47	......	0.57	......
71	♀	......do	Aug. 31, 1876	0.49	0.90	1.22	3.80	1.17	0.48	......	......	......
94	♂	Fort Sisseton, Dak.	Oct. 10, 1876	0.57	0.92	1.43	4.90	2.00	0.52	0.87	0.67	0.21
96	♂	......do	Oct. 28, 1876	0.45	0.95	1.30	4.00	1.50	0.45	0.80	0.46	0.19
97	♂	......do	Nov. 3, 1876	0.60	1.01	1.39	4.50	2.00	0.41	0.91	0.54	0.20
103	♂	......do	Nov. 12, 1876	0.55	1.06	1.38	4.10	1.80	0.46	0.90	0.61	0.22
105	♂	......do	Jan. 29, 1877	0.61	1.03	1.35	4.50	1.90	0.52	0.78	......	......
112	♀	......do	Mar. 26, 1877	0.60	0.95	1.26	4.30	1.78	0.61	0.90	0.57	0.23
183	♀ yg.	......do	June 9, 1877	0.51	0.94	1.20	3.70	1.45	0.56	0.84	0.45	0.20
184	♂	......do	June 10, 1877	0.63	1.17	1.44	4.40	2.00	0.63	0.84	0.46	0.23
204	♀	......do	Aug. 25, 1877	0.53	1.16	1.40	4.20	1.80	0.56	0.85	0.48	0.22
208	♂	......do	Sept. 8, 1877	0.58	1.20	1.36	4.00	1.70	0.57	0.35	0.44	0.20

EVOTOMYS RUTILUS GAPPERI, (*Vig.*) *Coues.*

The ordinary Red-backed Mouse is very abundant in this vicinity. The characteristic red marking of this Mouse is attained very early, for I have observed it in the young of all ages.

The nest of this Mouse in this vicinity is usually constructed on the ground, under a large bowlder, or sometimes under an old log or wood-pile, and is sparingly lined with grass or other suitable substances.

The young, of which there are from three to eight, are brought forth as early in May as the 3d, and I have also seen them as late as September 30th, from which I would infer that there are at least two litters brought out each year.

The measurements of the specimens taken are as follows:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Height of ears.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.	
53	♀	Fort Wadsworth, Dak	July 28, 1876	0.44	0.91	1.08	3.90	1.58	0.30	......	.....
68	♀	......do	Aug. 25, 1876	0.43	0.87	1.07	3.50	1.34	0.33	0.60	0.3
89	♂	Fort Sisseton, Dak	Oct. 4, 1876	0.48	0.82	1.00	3.20	1.50	0.35	0.61	0.44
95	♂	......do	Oct. 16, 1876	0.40	0.88	1.07	3.30	1.30	0.36	0.61	0.51
98	♂	......do	Nov. 3, 1876	0.44	0.86	1.01	3.40	1.40	0.31	0.61	.....
100	♂	......do	Nov. 4, 1876	0.46	0.78	1.00	3.10	1.45	0.30	0.62	.....
101	♂	......do	......do	0.42	0.81	1.10	3.20	1.50	0.35	0.61	.....
102	♂	......do	......do	0.40	0.81	1.04	3.10	1.25	0.30	0.67	.....
107	♂	......do	Mar. 21, 1877	0.41	0.88	0.98	3.50	1.29	0.39	0.69	0.41
108	♂	......do	......do	0.43	0.88	1.01	3.50	1.40	0.39	0.70	0.39
109	♂	......do	......do	0.43	0.84	1.03	3.50	1.35	0.41	0.66	0.3
136	♂	......do	Apr. 15, 1877	0.42	0.80	1.13	3.60	1.55	0.37	0.66	0.4
137	♀	......do	Apr. 16, 1877	0.42	0.79	1.05	3.50	1.50	0.35	0.65	0.49
138	♂	......do	......do	0.42	0.79	1.04	3.60	1.45	0.36	0.70	0.49
141	♀	......do	Apr. 17, 1877	0.48	0.90	1.08	3.50	1.75	0.40	0.64	0.46
142	♂	......do	......do	0.41	0.83	1.03	3.40	1.50	0.35	0.63	0.49
143	♀	......do	Apr. 18, 1877	0.44	0.90	1.05	3.50	1.60	0.40	0.69	0.43
146	♂	......do	Apr. 20, 1877	0.43	0.87	1.15	3.80	1.75	0.40	0.65	0.51

ARVICOLA (MYONOMES) RIPARIUS, *Ord.*

[Doubtless common in Dr. McChesney's locality. See bracketed remarks under next head. On calling the author's attention to this point, I am favored with the following reply:—

"*October* 22, 1877.—In ten specimens of *Arvicolæ* examined to-day, the U-,V-, or Y-shaped trefoil of the back upper molar is present in all but one; and no doubt, as you suggest, my list contains measurements of both *riparius* and *austerus*."—E. C.]

ARVICOLA (PEDOMYS) AUSTERUS, *LeConte.*

The Prairie Meadow Mouse is very common in this vicinity, provided I am right in referring all my specimens of the genus *Arvicola* to this species. Examination of the molars of several specimens has been attended with nearly uniform reference to *A. austerus;* and I, therefore, believe that *A. riparius* is found here only in small numbers.

I have observed this Mouse breeding here in May.

Measurements of specimens (with the above proviso) are as follows:—

[But unless each specimen has been examined by the molars, the list undoubtedly includes specimens of *A. riparius*.—E. C.]

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Height of ears.	Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
111	♀	Fort Sisseton, Dak..	Mar. 26, 1877	0.43	0.89	1.15	4.00	1.39	0.40	0.72	0.51	.....
117	♂	....do	Apr. 6, 1877	0.48	0.86	1.14	3.40	2.30	0.43	0.75	0.53	.....
118	♂	....do	.....do	0.55	1.01	1.18	4.00	1.90	0.42	0.68	0.55	.....
120	♂	....do	Apr. 11, 1877	0.43	0.91	1.23	3.50	1.50	0.35	0.77	.....	.....
123	♀	....do	May 13, 1877	0.47	0.95	1.25	3.50	1.55	0.36	0.71	0.45	.....
168	♂	....do	May 16, 1877	0.51	0.99	1.25	4.60	1.90	0.43	0.73	0.31	0.15
190	♂	....do	June 19, 1877	0.49	1.03	1.40	4.20	2.20	0.44	0.82	.....	0.18
194	♂	....do	June 29, 1877	0.42	1.01	1.27	4.00	1.60	0.40	0.73	.....	0.15
195	♀	....do	July 18, 1877	0.45	1.00	1.32	4.25	1.80	0.43	0.76	.....	.....
199	♂	....do	Aug. 14, 1877	0.46	0.92	1.22	3.50	1.75	0.42	0.77	.....	0.15
205	♂	....do	Sept. 7, 1877	0.44	0.92	1.12	3.70	1.60	0.37	0.75	.....	0.13

Measurements of one hundred specimens of ARVICOLA RIPARIUS *and* A. AUSTERUS *taken at Fort Sisseton, Dak., October 26, 1877, and carefully measured in the flesh by Charles E. McChesney, Acting Assistant Surgeon, United States Army.*

Number.	Sex.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Width of palm.	Remarks.
		Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
259	♂	0.45	0.90	1.32	4.10	1.90	0.46	0.70	0.15	
260	♂	0.43	0.85	1.33	4.10	1.70	0.40	0.76	0.16	
261	♀	0.43	0.83	1.24	3.80	1.48	0.43	0.72	0.13	
262	♂	0.45	0.89	1.40	4.10	2.25	0.45	0.75	0.16	
263	♀	0.46	0.91	1.24	3.60	1.50	0.43	0.77	0.15	
264	♀	0.42	0.91	1.30	3.70	1.55	0.42	0.75	0.14	
265	♀	0.43	0.91	1.25	3.70	1.45	0.41	0.70	0.15	
266	♀	0.40	0.85	1.17	3.70	1.47	0.41	0.73	0.15	
267	♀	0.48	0.87	1.26	4.00	1.90	0.46	0.70	0.15	
268	♂	0.45	0.93	1.20	4.00	1.80	0.46	0.75	0.15	
269	♀	0.46	0.97	1.25	3.90	1.48	0.44	0.71	0.15	
270	♀	0.43	0.86	1.22	3.90	1.50	0.43	0.74	0.14	
271	♂	0.44	0.95	1.23	4.00	1.65	0.43	0.74	0.15	
272	♂	0.44	0.86	1.17	3.70	1.43	0.43	0.75	0.14	
273	♂	0.44	0.89	1.26	4.00	1.55	0.43	0.74	0.15	
274	♀	0.47	0.94	1.30	4.50	1.90	0.46	0.76	0.16	
275	♂	0.46	0.86	1.19	3.50	1.45	0.45	0.76	0.13	
276	♂	0.41	0.88	1.17	3.50	1.55	0.41	0.72	0.14	Probably *A. riparius*.
277	♂	0.43	0.87	1.12	3.50	1.50	0.40	0.67	0.14	Probably *A. riparius*.
278	♂	0.46	0.97	1.24	4.00	1.60	0.43	0.75	0.15	Probably *A. riparius*.
279	♀	0.42	0.89	1.22	3.50	1.47	0.44	0.72	0.14	
280	♂	0.45	0.90	1.23	3.70	1.53	0.41	0.75	0.15	Probably *A. riparius*.
281	♂	0.42	0.90	1.16	3.80	1.70	0.45	0.75	0.15	
282	♂	0.44	0.89	1.20	3.75	1.80	0.42	0.74	0.15	
283	♂	0.45	0.93	1.10	3.70	1.40	0.42	0.76	0.15	
284	♂	0.47	0.96	1.18	3.70	1.50	0.45	0.82	0.15	
285	♂	0.44	0.89	1.20	3.60	1.45	0.45	0.75	0.14	
286	♀	0.44	0.86	1.18	3.50	1.40	0.43	0.75	0.14	Probably *A. riparius*.
287	♂	0.42	0.90	1.25	3.70	1.50	0.43	0.74	0.15	
288	♂	0.44	0.90	1.15	3.70	1.42	0.41	0.72	0.14	
289	♂	0.40	0.87	1.16	3.80	1.50	0.40	0.70	0.14	
290	♂	0.45	0.85	1.12	3.70	1.50	0.39	0.70	0.13	
291	♂	0.44	0.86	1.15	3.80	1.25	0.39	0.70	0.14	

Measurements of one hundred specimens of ARVICOLA RIPARIUS *and* A. AUSTERUS—Cont'd.

Number.	Sex.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Width of palm.	Remarks.
		Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
292	♀	0.46	0.87	1.22	4.10	1.80	0.44	0.71	0.14	
293	♂	0.40	0.83	1.08	3.70	1.25	0.40	0.70	0.14	
294	♂	0.43	0.87	1.18	3.90	1.30	0.45	0.76	0.14	
295	♀	0.43	0.82	1.20	3.60	1.45	0.40	0.70	0.14	
296	♂	0.41	0.89	1.20	3.95	1.55	0.40	0.75	0.14	
297	♀	0.45	0.89	1.15	3.70	1.30	0.42	0.73	0.14	
298	♂	0.44	0.91	1.20	4.00	1.30	0.41	0.71	0.14	
299	♂	0.40	0.80	1.12	3.70	1.45	0.41	0.72	0.14	
300	♂	0.44	0.85	1.15	3.95	1.50	0.44	0.77	0.13	
301	♂	0.40	0.86	1.15	3.50	1.30	0.40	0.68	0.14	Probably *A. riparius.*
302	♀	0.44	0.86	1.15	3.70	1.45	0.44	0.74	0.14	
303	♀	0.45	0.86	1.24	4.20	1.50	0.41	0.73	0.14	
304	♀	0.40	0.85	1.16	3.65	1.55	0.41	0.72	0.14	
305	♂	0.40	0.83	1.15	3.70	1.40	0.41	0.71	0.13	
306	♂	0.40	0.85	1.16	3.85	1.20	0.43	0.70	0.14	
307	♂	0.45	1.00	1.25	4.05	1.55	0.44	0.76	0.15	
308	♂	0.45	0.95	1.15	4.00	1.45	0.41	0.74	0.13	
309	♂	0.42	0.91	1.15	3.95	1.45	0.41	0.75	0.14	
310	♂	0.45	0.85	1.15	4.00	1.45	0.43	0.75	0.14	
311	♂	0.45	0.91	1.33	3.85	1.60	0.41	0.77	0.14	
312	♀	0.42	0.89	1.19	3.70	1.55	0.43	0.76	0.15	
313	♀	0.45	0.85	1.17	3.80	1.45	0.40	0.73	0.15	
314	♂	0.43	0.81	1.14	3.80	1.55	0.40	0.71	0.14	
315	♀	0.45	0.96	1.31	4.50	2.20	0.43	0.75	0.14	
316	♂	0.49	0.98	1.34	4.50	1.95	0.47	0.76	0.16	
317	♂	0.40	0.84	1.10	3.65	1.43	0.42	0.70	0.14	
318	♂	0.42	0.86	1.15	3.80	1.35	0.45	0.76	0.15	
319	♂	0.40	0.90	1.13	3.70	1.35	0.41	0.74	0.15	
320	♂	0.42	0.90	1.25	3.85	1.45	0.42	0.76	0.14	
321	♂	0.42	0.93	1.20	3.90	1.55	0.43	0.75	0.14	
322	♂	0.43	0.91	1.22	4.10	1.85	0.43	0.72	0.15	
323	♂	0.45	0.94	1.19	3.85	1.55	0.44	0.74	0.14	
324	♂	0.43	0.92	1.22	3.90	1.45	0.42	0.73	0.13	
325	♂	0.40	0.85	1.10	3.60	1.30	0.41	0.72	0.14	
326	♂	0.42	0.86	1.16	3.90	1.45	0.41	0.72	0.14	
327	♀	0.44	0.90	1.18	3.80	1.40	0.40	0.70	0.14	
328	♂	0.43	0.91	1.18	3.90	1.55	0.44	0.75	0.13	
329	♂	0.41	0.93	1.14	3.70	1.40	0.41	0.75	0.14	
330	♂	0.40	0.85	1.13	3.60	1.40	0.40	0.70	0.14	
331	♂	0.43	0.92	1.15	3.80	1.35	0.44	0.75	0.14	
332	♂	0.46	0.97	1.20	4.35	1.20	0.41	0.76	0.14	
333	♂	0.43	0.86	1.15	3.70	1.35	0.43	0.71	0.14	
334	♂	0.43	0.84	1.20	3.85	1.40	0.42	0.74	0.14	
335	♂	0.41	0.85	1.18	3.80	1.40	0.41	0.73	0.14	
336	♀	0.42	0.85	1.24	3.75	1.50	0.44	0.71	0.14	
337	♂	0.45	0.90	1.12	3.85	1.45	0.42	0.72	0.14	
338	♂	0.45	0.82	1.19	3.70	1.35	0.41	0.70	0.14	
339	♀	0.44	0.90	1.20	3.70	1.30	0.44	0.75	0.14	
340	♂	0.40	0.84	1.08	3.50	1.30	0.44	0.72	0.14	Probably *A. riparius.*
341	♂	0.41	0.81	1.13	3.80	1.40	0.41	0.72	0.14	
342	♂	0.40	0.81	1.14	3.65	1.50	0.40	0.71	0.13	
343	♂	0.42	0.89	1.17	3.80	1.45	0.43	0.75	0.14	
344	♂	0.42	0.93	1.27	4.00	1.50	0.41	0.73	0.14	
345	♂	0.42	0.83	1.11	3.50	1.30	0.41	0.71	0.13	Probably *A. riparius.*
346	♂	0.41	0.92	1.23	4.10	1.70	0.44	0.76	0.14	
347	♂	0.44	0.96	1.32	4.10	1.90	0.44	0.76	0.14	
348	♂	0.44	1.00	1.23	4.20	1.75	0.43	0.74	0.15	
349	♂	0.43	0.89	1.21	3.80	1.40	0.41	0.72	0.15	
350	♀	0.40	0.96	1.17	3.60	1.25	0.41	0.72	0.14	Probably *A. riparius.*
351	♀	0.45	0.89	1.28	4.20	1.95	0.45	0.77	0.15	
352	♂	0.42	0.86	1.12	3.70	1.25	0.43	0.70	0.14	
353	♂	0.39	0.84	1.00	3.50	1.20	0.39	0.69	0.13	Probably *A. riparius.*
354	♂	0.40	0.84	1.08	3.60	1.30	0.41	0.72	0.14	Probably *A. riparius.*
355	♂	0.46	0.90	1.37	4.40	2.20	0.41	0.77	0.15	
356	♀	0.43	0.89	1.12	3.70	1.40	0.40	0.70	0.14	
357	♀	0.44	0.90	1.20	3.95	1.40	0.41	0.74	0.13	
358	♂	0.41	0.82	1.15	3.60	1.65	0.41	0.70	0.14	Probably *A. riparius.*

I have no idea that all the above specimens not marked as probably *A. riparius* are *A. austerus.* Examination of the molars would probably reveal that both are included in the list indiscriminately.

With all these specimens before me in the flesh, I was at first inclined to think separation of the two species could be made by coloration alone, viz, by the darker appearance of *A. riparius* both on the back and belly, and by the black legs and feet, and such may possibly be done to a small extent, especially with extremes of the two species; but the coloration was soon found to intermingle to such an extent that examination of the molars alone would determine to which species the specimen belonged.

The tails were found to vary from distinctly bicolor to almost entirely black.

The backs varied from dark brown to a decidedly reddish cast; some were also nearly grizzly-gray.

The under parts varied from silvery-gray to dark brown.

The legs and feet varied from black to almost white.

FIBER ZIBETHICUS, (*Linn.*) *Cuvier.*

The Muskrat is the most abundant of all the mammals inhabiting this region. As many as twenty thousand have been taken in a single season within a few miles of this post.

SACCOMYIDÆ.

CRICETODIPUS FLAVUS, *Baird.*

The Yellow Pouched Mouse is found in small numbers in this region. Specimens taken are a little larger than those enumerated by Baird.

List of specimens.

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—	
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.
60	♂	Fort Wadsworth, Dak	Aug. 15, 1876	0.38	0.77	0.91	2.58	1.77	0.24	......
76	♂	Fort Sisseton, Dak	Sept. 23, 1876	0.46	0.81	1.07	2.73	2.75	0.30	0.71
88	♂	......do	Oct. 1, 1876	0.42	0.71	0.94	2.75	2.00	0.27	0.70
104	♀	......do	Nov. 15, 1876	0.46	0.77	0.97	2.50	2.40	0.30	0.67

GEOMYIDÆ.

GEOMYS BURSARIUS, *Shaw.*

The Pouched Gopher is one of the most abundant of all the mammals inhabiting the prairie of this vicinity. I certainly disagree with those authorities (and my opportunities for forming a correct opinion have been as great as, if not greater than, any former observer's) who believe that the cheek-pouches of this mammal are used for the removal of sand from their burrows; for in all the numerous specimens taken here, no earth has ever been found in their pouches, but, on the contrary, I have frequently found young grass, leaves, and roots in their pouches, and I believe that the succulent young grass, when procurable, frequently constitutes their main article of food. It might be objected that my specimens have all been taken while returning from a foraging trip, but such is not the case.

The Pouched Gopher in this region is found in towns or villages, much resembling the Prairie Dog towns, so familiar to all observers in many sections of the Northwest, with the exception that their burrows have no external openings, these being carefully closed by the animal.

There is ordinarily no difficulty in capturing this animal by judicious use of steel traps that do not require much pressure to spring; and to the failure to comply with this requirement is, I believe, mainly to be attributed the ill success of most collectors; although there is a period in addition to the winter months (which is here found to be from about the middle of June to the end of August) when the acquisition of specimens is attended with great difficulties. No doubt but at this time the parents are to a great extent engaged in rearing their young, and scarcely ever emerge from their subterranean homes. I have, however, seen a very few quite young specimens by the middle of June; but I believe the greater majority are brought forth between the middle of June and the end of August, and that but one litter is brought out each year.

The diagnostic value of the markings of the upper incisors, as pointed out by Dr. Coues in his admirable review of *Geomys* and *Thomomys*, is confirmed in my specimens. The groove, or sulcus, nearly bisecting the incisors, is more distinct in the young than in the old, becoming more shallow in proportion to the age of the animal, and in very old specimens I can detect no sign of the third groove of Coues, although in many of the young and middle-aged it is distinctly perceptible.

The measurements of the specimens taken here are as follows:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—			Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.	Longest fore claw.	
3	♂	Fort Wadsworth, Dak.	May 10, 1876	1.12	1.94	2.62	9.00	3.07	1.80	1.37	0.93	......
4	♀	....do	.....do	0.98	1.51	2.05	7.90	2.60	1.60	1.27	0.77	.....
5	♀	....do	.... do	1.00	1.61	2.00	7.20	2.60	1.47	1.05	0.62	......
6	♂	....do	May 12, 1876	1.10	1.93	2.36	8.50	2.96	1.66	1.35	0.81	.....
7	♂	....do	.....do	0.94	1.60	2.08	6.50	2.57	1.50	1.20	0.70	....
8	♂	....do	May 13, 1876	1.09	1.73	2.12	8.50	2.62	1.64	1.27	0.80	.....
9	♂	....do	.....do	1.25	1.84	2.45	9.25	3.13	1.70	1.30	0.84	......
10	♀	....do	May 15, 1876	0.94	1.46	2.05	7.50	2.48	1.60	1.18	0.80	.....
11	♀	....do	.....do	0.91	1.46	1.97	7.00	2.45	1.46	1.14	0.73	.....
12	♀	....do	May 16, 1876	0.95	1.47	1.97	7.30	2.50	1.55	1.22	0.67	.....
13	♀	....do	.....do	0.90	1.55	1.97	7.43	2.72	1.60	1.27	0.69	.....
14	♂	... do	May 30, 1876	1.10	1.71	2.20	9.00	2.65	1.82	1.33	0.83	.....
15	♂	....do	.....do	1.23	2.15	2.47	9.25	3.05	1.78	1.40	0.81	......
16	♀	....do	.....do	0 86	1.57	2.00	8.00	2.76	1.63	1.35	0.75	......
17	♀	....do	.... do	0.81	1.53	2.03	8.00	2.61	1.60	1.27	0.74	.....
18	♂	....do	June 3, 1876	1.05	1.81	2.30	9.25	2.77	1.85	1.43	0.82	.....
19	♀	....do	.....do	0.95	1.56	2.00	8.00	2.67	1.68	1.21	0.73	.....
21	♂	....do	June 4, 1876	0.98	1.71	2.02	8.25	3.00	1.69	1.38	0.75	.....
22	♀	....do	.....do	0.88	1.50	1.90	7.50	2.83	1.57	1.18	0.60	.....
24	♂	....do	June 26, 1876	1.15	1.99	2.50	9.00	3.11	1.76	1.43	0.83	.....
25	♀	....do	.....do	1.02	1.62	2.20	7.85	2.77	1.68	1.33	0.81	.....
26	♀	....do	.....do	0.93	1.54	2.12	7.12	2.67	1.55	1.28	0.66	.....

Measurements, &c—Continued.

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—			Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.	Longest fore claw.	
31	♀ yg.	do	July 4, 1876	0.62	1.15	1.63	6.00	2.25	1.37	1.14	0.47	......
32	♂ yg.	do	do	0.71	1.25	1.62	6.50	2.68	1.55	1.25	0.57	......
33	♀	do	do	0.91	1.47	2.00	8.25	2.66	1.65	1.23	0.70	......
35	♀	do	July 7, 1876	0.96	1.55	1.92	7.00	2.92	1.64	1.25	0.70	......
40	♂ yg.	do	July 8, 1876	0.77	1.19	2.10	6.08	2.55	1.55	1.26	0.64	......
42	♂	do	July 10, 1876	1.09	1.54	2.20	8.50	3.03	1.82	1.37	0.73	......
44	♀ yg.	do	July 13, 1876	0.74	1.33	1.72	5.80	1.95	1.15	0.73	0.46	......
113	♂	Fort Sisseton, Dak	Apr. 2, 1877	1.18	2.10	2.93	8.75	3.10	1.85	1.40	0.87	0.53
122	♂	do	Apr. 12, 1877	1.23	1.96	3.00	8.90	3.00	1.75	1.37	0.61	0.60
123	♂	do	do	1.10	1.70	2.75	8.10	3.10	1.78	1.40	0.65	0.52
124	♀	do	do	0.95	1.51	2.19	7.00	2.50	1.64	1.27	0.61	0.46
125	♀	do	do	0.86	1.36	2.08	6.50	2.40	1.67	1.19	0.66	0.44
126	♂	do	Apr. 13, 1877	1.28	1.89	3.08	9.00	3.00	1.72	1.30	0.64	0.52
127	♂	do	do	1.12	1.77	2.75	7.60	2.80	1.78	1.37	0.62	0.50
128	♀	do	do	1.07	1.65	2.68	7.10	3.00	1.75	1.23	0.66	0.47
129	♀	do*	do	1.08	1.74	2.63	7.00	3.10	1.70	1.25	0.69	0.51
130	♂	do	do	1.13	1.80	2.83	7.90	3.50	1.83	1.40	0.69	0.52
131	♂	do	do	1.11	1.85	3.05	8.90	3.30	1.90	1.38	0.76	0.54
132	♂	do	do	1.25	1.85	3.15	9.00	3.60	1.84	1.40	0.67	0.52
134	♀	do	Apr. 15, 1877	1.03	1.61	2.51	7.00	2.90	1.68	1.34	0.58	0.44
135	♂	do	do	1.34	2.05	3.20	8.70	2.50	1.91	1.35	0.65	0.52
139	♀	do	Apr. 16, 1877	1.02	1.64	2.53	6.90	3.20	1.67	1.30	0.51	0.47
140	♂	do	Apr. 17, 1877	1.12	1.96	2.81	8.50	3.50	1.83	1.43	0.65	0.55
144	♂	do	Apr. 20, 1877	1.25	2.01	2.83	8.50	3.20	1.97	1.46	0.68	0.56
145	♀	do	do	1.00	1.75	2.47	7.00	3.10	1.68	1.21	0.56	0.48
146	♂	do	Apr. 23, 1877	1.21	1.87	2.97	8.50	3.50	1.97	1.47	0.83	0.51
148	♀	do	do	1.03	1.51	2.35	7.00	2.90	1.65	1.25	0.70	0.50
149	♂	do	Apr. 24, 1877	1.29	1.97	2.97	8.90	3.00	1.75	1.35	0.67	0.53
150	♀	do	do	0.96	1.44	2.33	6.50	2.70	1.50	1.17	0.69	0.41
151	♂	do	Apr. 25, 1877	1.28	1.97	3.00	8.70	3.40	2.05	1.49	0.85	0.56
152	♀	do	do	1.01	1.61	2.25	6.50	3.05	1.70	1.24	0.75	0.45
153	♀	do	Apr. 26, 1877	1.08	1.60	2.35	7.10	3.10	1.81	1.36	0.82	0.50
157	♂	do	May 3, 1877	1.35	2.02	3.05	8.30	3.00	1.85	1.42	0.88	0.55
158	♀	do	May 4, 1877	0.99	1.68	2.34	7.00	2.90	1.61	1.29	0.67	0.42
159	♀	do	May 6, 1877	0.88	1.60	2.17	6.50	2.50	1.58	1.14	0.74	0.41
160	♂	do	do	1.06	1.87	3.00	8.00	3.00	1.90	1.43	0.76	0.54
162	♂	do	May 8, 1877	1.08	1.93	2.95	8.20	3.30	1.89	1.38	0.81	0.49
163	♂	do	do	1.13	1.89	2.72	7.60	3.00	1.78	1.42	0.73	0.49
165	♀	do	May 10, 1877	0.98	1.57	2.75	7.50	3.00	1.72	1.36	0.79	0.43
166	♀	do	do	1.10	1.60	2.66	7.00	3.00	1.67	1.32	0.74	0.51
178	♀	do	May 28, 1877	0.97	1.66	2.40	7.00	3.10	1.71	1.35	0.73	0.45
179	♀	do	do	0.94	1.67	2.42	7.20	3.30	1.73	1.35	0.69	0.45
180	♀	do	June 2, 1877	0.96	1.56	2.45	6.30	3.25	1.55	1.35	0.69	0.45
181	♀	do	do	1.05	1.66	2.55	6.80	3.50	1.65	1.28	0.73	0.48
182	♂	do	June 4, 1877	1.18	1.96	3.15	8.20	3.90	1.80	1.47	0.73	0.52
185	♂	do	June 14, 1877	1.26	2.03	3.08	8.00	4.00	1.89	1.55	0.81	0.54
186	♀	do	do	0.97	1.60	2.25	6.80	2.90	1.65	1.29	0.61	0.48
187	♂ yg	do	June 16, 1877	0.71	1.11	1.70	5.00	1.93	1.29	1.10	0.37	0.39
188	♀	do	do	0.95	1.50	2.25	7.00	3.20	1.62	1.27	0.61	0.45
189	♂	do	do	0.95	1.40	2.25	6.50	3.00	1.65	1.25	0.72	......
191	♂	do	June 19, 1877	1.20	1.93	3.14	8.00	3.40	1.70	1.32	0.66	0.46
From the above we obtain the following:—												
Minimum* of 33 ♂				0.94	1.40	2.02	6.50	2.70	1.50	1.20	0.61	0.46
Maximum* of 33 ♂				1.35	2.15	3.20	9.25	4.00	2.05	1.55	0.93	0.60
Mean* of 33 ♂				1.16	1.87	2.73	8.42	3.12	1.80	1.38	0.75	†0.53
Minimum* of 35 ♀				0.81	1.36	1.90	6.30	2.40	1.46	1.05	0.51	0.41
Maximum* of 35 ♀				1.10	1.75	2.75	8.25	3.50	1.81	1.36	0.82	0.51
Mean* of 35 ♀				0.96	1.57	2.25	7.16	2.85	1.63	1.26	0.69	†0.46
Mean of 63 specimens				1.06	1.72	2.48	7.79	2.99	1.72	1.32	0.72	0.49

* Nos. 31, 32, 40, 44, and 187 are excluded from these results on account of age.
† Mean of 21 specimens.

Anatomy of the contractor muscle of the pouch of G. BURSARIUS.

As is well known, the pouch of this mammal is simply a pocket-shaped duplicature of the skin of the sides of the head and neck, extending well back over the shoulder, and with its aperture surrounded by a long, narrow, and delicate *constrictor* muscle.

The *contractor* muscle is best exposed by a simple incision extending from the head down the middle of the vertebral column to a point opposite the hind legs. Care must be taken in making this incision to keep to the *median* line, especially as the incision is extended backward, and to cut through the *skin and superficial fascia only*, as otherwise the muscle might be severed near its movable end, which would prove fatal to the study of this portion of it.

As has been intimated by Professor Coues in his work before cited in this article, this muscle may be considered a modified form of the *platysma myoides*, presenting, however, certain well-marked differences, which will become apparent in the course of this description.

For the purposes of this description, I shall divide the muscle into two parts, the first part commencing at the movable head and ending at the inferior angle of the pouch, where the muscle divides; and the second part commencing at this termination of the first portion, and ending with the insertion of the different heads into the maxillary bones.

First part.—Commencing at the movable head of this muscle, which is attached by a broad, thin tendon, blending with the tendons of the muscles of the back, covering the last three lumbar vertebræ, and from which it cannot be dissected nor traced beyond, we find that it runs in a nearly straight direction to the inferior angle of the pouch, *i. e.*, the extreme portion of the pouch which extends backward over the shoulder. At first it overlies the muscles covering the vertebræ, and afterward it runs nearly parallel with, but as it approaches the pouch diverges from, the spinal column.

The muscle lies in this portion of its course, until near the pouch, under the superficial fascia and in close connection with the skin of the animal above, and beneath with the muscles of the back and shoulder of the animal. As the muscle nears the pouch, it is crossed by a muscle running from the upper and outer part of the shoulder to the ear. This part of the muscle varies from 0.22 to 0.30 of an inch in width, is quite thin, and about 4½ inches in length.

Second portion.—At the termination of the first part of the course of this muscle, just as it comes in contact with the pouch, it divides into two parts, one of which passes over the upper or outer portion of the pouch, and is inserted into the superior maxillary bone directly below the nose. This part of the muscle is very narrow, and great care is necessary that it is not cut away. This band of the muscle lies on the sac below, and is covered by the skin and superficial fascia only.

The other portion of the muscle passes along the inner and lower surface of the pouch, and along the superior and inferior borders thereof, its fibres expanding so as to cover nearly the entire under surface of the sac. The fibres running along the superior border of the pouch are attached with those of the muscle passing over the upper part of the pouch to the superior maxillary bone. The remainder of the fibres are attached to the outer and lower surface of the body of the inferior maxillary bone, precisely similar to the attachment of the *platysma myoides*. The muscle in this portion of its course is covered by the sac, and is in relation below with the muscles of the inferior maxillary bone and of the neck.

It will thus be seen that the great muscular power possessed by the animal over its pouch is exerted from its lower or inner surface, its upper or outer surface being but poorly supplied with muscular fibres.

THOMOMYS TALPOIDES, (*Rich.*) *Baird.*

This Gopher is not abundant in this region. It shares many of the habits of its relative, *G. bursarius*, and is found occupying the same ground and apparently living in the midst of that species.

This Gopher breeds during the latter part of July and early in August, and I believe there is but one litter annually.

Measurements of specimens taken are as follows:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Longest fore claw.	Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
1	♀	Fort Wadsworth, Dak.	May 14, 1876	0.72	1.36	1.63	6.30	1.84	1.09	1.09	0.50	......
2	♂	....do	May 15, 1876	0.77	1.38	1.87	7.00	1.87	1.17	1.17	0.47	......
54	♂	....do	July 28, 1876	0.83	1.50	1.81	7.00	2.10	1.13	1.13	0.49	......
61	♀ yg.	....do	Aug. 16, 1876	0.64	1.23	1.63	4.50	1.72	1.00	0.97	0.38	....
177	♀	Fort Sisseton, Dak.	May 25, 1877	0.65	1.47	2.00	6.00	2.50	1.25	1.19	0.46	0.38

SCIURIDÆ.

TAMIAS STRIATUS, (*Linn.*) *Baird.*

The beautiful little Chipmunk is quite common in this vicinity, and makes his appearance about the first of April, thus being one of the earliest of our mammals to welcome the return of spring.

The Chipmunk disappears by the end of April, and I have been unable to learn anything of its breeding.

A large number of specimens have been captured, but I was unfortunately unable to preserve them at the time.

The measurements of the specimens preserved are as follows:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—	
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.
114	♂	Fort Sisseton, Dak	Apr. 3, 1877	0.73	1.34	1.68	6.50	4.20	0.76	1.37
115	♀	......do	......do	0.69	1.34	1.70	6.10	4.50	0.85	1.34
116	♂	......do	Apr. 4, 1877	0.80	1.40	1.90	6.50	4.50	0.83	1.38

SPERMOPHILUS FRANKLINI, (*Sab.*) *Rich.*

The Gray Gopher is quite common in this vicinity. It is not, however, an exclusively Ground Squirrel, being often seen on trees, and here its hole is usually found in a dead tree, but sometimes is dug at the foot of a tree. I believe it lays in a store of provisions sufficient for its winter use, and scarcely ever emerges from its home during this season, for careful search has failed to reveal its presence during winter.

It breeds about June 25th, and I believe but one litter is brought forth each year. The female suckles her young for five or six weeks.

Professor Baird, in his work on North American Mammals, pp. 306 and 315, is in error in stating that the "head is pure gray, without any tinge of yellowish". Such is undoubtedly the case with the young; but in mature specimens there is not only a tinge of yellowish, but this coloration is quite distinct, and occurs sufficiently often to consider it a normal marking of this mammal. I have observed the yellowish coloration extend as far on the head as the eyes, and also on the upper part of the tail for about one-fourth of its length.

The cheek-pouches of *S. franklini* open internally, directly into the mouth, and are quite small, having a capacity of about one-third of a teaspoonful only.

The pouches themselves have no true muscular structure, being simply a pocket-shaped duplicature of the skin of the sides of the head, and possessing no more elastic power than this tissue ordinarily does.

The pouches do not extend quite to the ears, and we observe nothing like the muscular structure of the pouches of *Geomys* and *Thomomys*, which possess a true *constrictor* and a *contractor* muscle, but there is deflected from the posterior portion of the sac a special tendon, broad (comparatively speaking), which replaces the muscle found in the species of *Geomys* and *Thomomys*, but which soon becomes part of, and is lost in, the superficial fascia of the sides of the neck.

Measurements of specimens.

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Longest fore claw.	Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
23	♂	Fort Wadsworth, Dak.	Jan. 12, 1876	1.01	2.00	2.59	10.00	6.25	1.28	1.92	......	......
154	♂	Fort Sisseton, Dak.	Apr. 30, 1877	0.96	1.81	2.42	9.00	6.00	1.20	1.88	0.35	0.36
161	♂	....do	May 7, 1877	1.05	2.08	2.82	9.50	.....	1.28	2.12	0.39	0.41
169	♂	....do	May 17, 1877	1.05	2.07	2.65	9.00	6.10	1.28	2.00	0.34	0.41
170	♂	....do	.....do	1.03	1.98	2.75	9.50	5.50	1.28	2.01	0.41	0.41
171	♂	....do	.....do	0.98	1.92	2.61	9.20	6.40	1.26	2.00	0.39	0.40
172	♂	....do	.....do	0.93	1.93	2.65	9.00	6.00	1.23	1.99	0.38	0.38
175	♂	....do	May 23, 1877	0.94	1.87	2.55	9.10	6.00	1.26	1.91	0.41	0.42
192	♀	....do	June 21, 1877	0.98	1.86	2.44	9.50	7.00	1.35	1.92	0.42	0.40
193	♀	....do	.....do	0.96	1.87	2.35	9.30	6.00	1.33	1.98	0.39	0.39
197	♀	....do	June 25, 1877	0.95	1.99	2.60	10.05	6.50	1.27	1.94	0.41	0.40

SPERMOPHILUS TRIDECEM-LINEATUS, (*Mitch.*) *Aud. & Bach.*

The Striped Prairie Squirrel is very common on the Coteau; their holes may be seen almost everywhere and in large numbers. This Squirrel makes its appearance very early in the spring, as soon as the ground is thawed sufficiently, and is seen daily until the approach of winter drives it to its underground home. This Squirrel is a very polite animal, always, before retiring to its home when disturbed, stopping at its hole, standing on its hind legs for a moment, bowing, and then disappearing.

The young are brought forth during the latter part of May and early in June, and I believe there is but one litter annually, usually containing from four to eight.

The following are the measurements of the specimens preserved:—

Number.	Sex.	Place of collecting.	Date of collecting.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Longest fore claw.	Width of palms.
				Eye.	Ear.	Occiput.	Tail.		Fore foot.	Hind foot.		
34	♀	Fort Wadsworth	July 5, 1876	0.75	1.48	1.93	7.34	4.10	0.90	*0.70	0.26	......
36	♂	......do	July 6, 1876	0.75	1.51	2.09	8.00	4.78	0.97	*0.77	......	......
37	♂ yg.	......do	July 7, 1876	0.56	1.23	1.47	4.75	2.70	0.75	*0.60	......	......
43	♂	......do	July 13, 1876	0.72	1.34	1.75	6.50	4.44	0.85	*0.75	......	......
45	♂	......do	July 14, 1876	0.65	1.42	1.60	6.50	3.85	0.94	*0.75	......	......
46	♂	......do	July 15, 1876	0.65	1.43	1.76	6.75	3.57	0.92	*0.77	......	......
47	♂	......do	July 17, 1876	0.77	1.47	1.92	8.00	4.30	0.90	*0.74	......	.....
79	♂	Fort Sisseton	Sept. 23, 1876	0.90	1.46	2.02	7.50	......	0.94	1.28	0.34	......
155	♂	......do	May 1, 1877	0.75	1.58	1.82	7.60	4.50	1.02	1.51	0.33	0.29
156	♂	......do	.....do	0.76	1.56	1.90	7.80	4.00	......	1.45	0.36	0.28

* Naked part of sole only measured.

HYSTRICIDÆ.

ERETHIZON DORSATUM, *Ouvier.*

The Porcupine was a few years ago found on the Coteau, in the vicinity of this post, in small numbers. None have been seen of late years, however, and I believe it is not an inhabitant of this section of the country.

LEPORIDÆ.

LEPUS CAMPESTRIS, *Bach.*

The Prairie Hare is found here in small numbers only.

LEPUS SYLVATICUS, *Bach.*

The Gray Rabbit is not common on the Coteau des Prairies.

NOTE.—All measurements have been carefully taken in the flesh, and are expressed in inches and hundredths.

The name of the post at which these collections have been made was changed from Fort Wadsworth to Fort Sisseton in August, 1876.

ART. IX.—STUDIES OF THE AMERICAN HERODIONES.

PART I.—SYNOPSIS OF THE AMERICAN GENERA OF ARDEIDÆ AND CICONIIDÆ; INCLUDING DESCRIPTIONS OF THREE NEW GENERA, AND A MONOGRAPH OF THE AMERICAN SPECIES OF THE GENUS ARDEA, LINN.

By Robert Ridgway.

Order HERODIONES.—Altricial Grallatores.

< ***Herodiones***, Bonap. Consp. ii. 1855, 97 (includes *Gruidæ*, *Psophiidæ*, *Cariamidæ* ("*Sariamidæ*"), *Aramidæ*, "*Ciconidæ*", *Ardeidæ*, *Cancromidæ*, *Scopidæ*, *Eurypygidæ*, *Phœnicopteridæ*, *Plataleidæ*, and "*Tantalidæ*").—Baird, Birds N. Am. 1858, 651 (includes *Gruidæ*, *Aramidæ*, *Ardeidæ*, "*Tantalidæ*", *Plataleidæ*, and *Phœnicopteridæ*).—Scl. & Salv. Nom. Neotr. 1873, vii. (includes *Ardeidæ*, *Ciconiidæ*, *Plataleidæ*, and *Phœnicopteridæ*).

= *Herodiones* (suborder, < *Grallatores*), Coues, Key, 1872, 240, 262.—Boucard, Catalogus Avium, 1876, 48 (order: includes "*Tantalidæ*", *Dromadidæ*, *Ardeidæ*, "*Ciconiidæ*", and *Plataleidæ*).

= *Ciconiæ*, Bonap. Consp. ii. 1855, 104.

> *Erodii*, Nitzsch, *t. c.* 127 (includes *Ardea* and other *Ardeidæ*, *Cancroma*, and *Eurypyga*).

> *Pelargi*, Nitzsch, Pterylog. 1840, 130 (includes *Scopus*, *Ciconia*, *Anastomus*, and *Tantalus*).—Sundev. Met. Nat. Av. Disp. Tent. 1872, 123.

> *Herodii*, Sundev. *t. c.* 122.

< *Grallatores longirostres*, Reichenb. Handb. 1851, xi. xiii. (includes *Ibididæ* and *Tantalinæ*).

> *Grallatores magnirostres*, Reichenb. *t. c.* xi. v. (includes *Ardeidæ*, *Ciconiidæ*, and *Plataleidæ*).

< *Grallæ*, Lilljeborg, P. Z. S. 1866, 10, 15 (includes *Phœnicopteridæ*, *Rallidæ*, *Palamedeidæ*, *Psophidæ*, *Ardeidæ*, "*Ciconidæ*", *Gruidæ*, "*Totanidæ*", *Scolopacidæ*, *Charadridæ*, and *Otididæ!*).—Gray, Handlist, iii. 1871, v. 7 (includes *Otidiæ*, *Charadriadæ*, *Glareolidæ*, *Thinocoridæ*, *Chionididæ* *Hæmatopodidæ*, *Psophidæ*, *Cariamidæ*, *Gruidæ*, *Eurypygidæ*, *Rhynochetidæ*, *Ardeidæ*, *Ciconiidæ*, *Plataleidæ*, "*Tantalidæ*", *Dromadidæ*, *Scolopacidæ*, *Phalaropodidæ*, *Rallidæ*, "*Gallinulidæ*", *Heliornithidæ*, *Parridæ*, and *Palamedeidæ!*).

= *Pelargomorphæ*, Huxley, P. Z. S. 1867, 461.

(=?) *Grallatores altinares*, Sundev. Meth. Nat. Av. Disp. Tent. 1872, 121 (includes "*Herodii*" and "*Pelargi*"; under the latter [as "Fam. 4"] *Scopinæ*, including *Balæniceps!*).

Ch.—Altricial Grallatores, with the hallux lengthened, and nearly or quite incumbent; in habits more or less arboreal (generally nesting on trees, while all are "Perchers"). Palate desmognathous. Carotids double.

The above brief diagnosis is sufficient to succinctly characterize this eminently natural group of birds. The *Herodiones*, which include the Boatbills (*Cancromidæ*), Herons (*Ardeidæ*), Storks (*Ciconiidæ*), Ibises (*Ibididæ*), and Spoonbills (*Plataleidæ*), with, perhaps, but not certainly, some other minor groups, are at once distinguished from the Flamingoes (*Phœnicopteri*), Cranes (*Grues*), and all other wading-birds, by their altricial nature, the young being born completely helpless, and have to be reared in the nest by the constant attention of their parents, while those of other wading-birds are at once capable of active movement and able to immediately shift for themselves, although they *follow* their parents for a considerable time.[*]

There are also equally important osteological[†] and anatomical peculiarities of structure, which alone are sufficient to demonstrate the fact that this group is not intimately related to other Waders, and that their general exterior resemblance to the latter is one of analogy and not of affinity.

The water-birds most nearly related structurally to the *Herodiones* are the *Steganopodes*—Pelicans, Cormorants, Gannets, and their allies—which are likewise both desmognathous and altricial; and what is an important fact in this connection is the circumstance that besides being altricial, they are, with very few exceptions, also decidedly arboreal, most of them even placing their nests on trees. They are swimmers, however, instead of being merely waders.

Without discussing further the characters which distinguish this "order", I proceed to define the families into which it seems most naturally divisible.

Synopsis of the American Herodionine Families.

A.—Pterylæ very narrow, interspersed with "powder-down" tracts. Hallux perfectly incumbent; inner edge of middle claw distinctly pectinated. (*Herodiones ardeiniformes*, = *Herodii*, Sundev. Meth. Nat. Av. Disp. Tent. 1872, 122.)

1. Cancromidæ. Four pairs of powder-down tracts. Bill greatly depressed and excessively dilated laterally, the lateral outlines much bowed; gonys excessively short, not longer than the width of the mandibular rami.

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[*] It is my opinion that the importance of this distinction between birds has not been sufficiently recognized. It is certainly a more natural division than that of "*Psilopædes*" and "*Ptilopædes*" (Sundevall, *Methodi Naturalis Avium Disponendarum Tentamen*, Stockholm, 1872–73), whereby the *Struthiones* are brought into close relationship with the *Gallinæ*, and the *Herodiones* next to the *Limicolæ* and *Grues*—certainly a much more artificial arrangement.

[†] According to Huxley (P. Z. S. 1867, 461), the osteological characters of this group are as follows:—

There are no basipterygoid processes; the palatines are usually united for a greater or less distance behind the posterior nares, and are destitute of a vertical plate depending from their junction; the maxillo-palatines large and spongy; the sternum broad, and with two to four posterior notches. The relation between the phalanges is the same as in the *Chenomorphæ* and *Amphimorphæ*.

2. ARDEIDÆ. Two to three pairs of powder-down tracts. Bill compressed, elongate-conical, the lateral outlines straight or even a little concave; the vertical outlines nearly straight, slightly convex terminally; gonys lengthened, several times longer than the width of the mandibular rami.

B.—Pterylæ broad, without powder-down tracts. Hallux elevated at the base above the base of the anterior toes; inner edge of middle claw not pectinated; *claws resting upon a horny, crescentic "shoe"*. (*Herodiones ciconiiformes*, = *Pelargi*, SUNDEV. Meth. Nat. Av. Disp. Tent. 1872, 123.)

a. Sides of the maxilla without any trace of lateral groove. Skull holorhinal. Angle of the mandible truncated. *Pectoralis major* muscle in two easily separable layers. No *accessory femoro-caudal* muscle; *semitendinosus* musle tendinous for its distal half; *biceps cubiti* and *tensor patagii longus* muscles unconnected. (GARROD.*)

3. CICONIIDÆ. Bill elongate-conical, either straight or curved a little up or down at the end.

b. Sides of the maxilla with a deep, narrow groove, extending uninterruptedly from the nasal fossæ to the extreme tip of the bill. Skull schizorhinal. Angle of the mandible produced and decurved. *Pectoralis major* muscle simple (not separable into distinct layers); *accessory femoro-caudal* muscle well developed; *semitendinosus* muscle muscular throughout; *biceps cubiti* and *tensor patagii longus* muscles connected by a small muscular "belly". (GARROD.)

4. IBIDIDÆ. Bill slender, attenuated terminally, nearly cylindrical or somewhat compressed, conspicuously decurved, or arched above.

5. PLATALEIDÆ. Bill very broad, excessively depressed and greatly expanded terminally, much narrowed across the middle portion, the extreme tip only much decurved.

In addition to the above well-defined families, all of which have American representatives, while one (*Cancromidæ*) is peculiarly American, there are several others which probably belong to the *Herodiones*, but which, excepting the American family *Eurypygidæ* (Sun Bitterns), I have had no opportunity to examine, and therefore pass by for the present without special reference.

The *Eurypygidæ* are small, Bittern-like birds, with beautifully-variegated plumage, and differ from the true Herons in their densely feathered lores, shorter and more elevated hallux, absence of pectinations to the edge of the middle claw, very long (extremely unheron-like) tail, and other features. Later systematists have placed this form near the Rails (*Rallidæ*)—far from the *Herodiones*. It comes much nearer the latter, however, since, while being decidedly Herodionine in external structure, it is also truly Altricial, although the young are born covered with a close, variegated down, much as in the *Grallæ* proper; the egg, also, is quite Plover-like in appearance (*conf.* BARTLETT, Proc. Zool. Soc. Lond. 1866, 76, pl. ix.). As still further indicating its affinity to the Herons, *Eurypyga* possesses a pair of large uropygial powder-down tracts; while Nitzsch states (Pterylographia, p. 129, pl. viii. f. 15) that, as to its pterylography in general, "the uninterrupted plumage, not only of the head, but also of the entire neck", "is indisputably the chief distinction of this genus from *Ardea*".

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* See P. Z. S. 1875, p. 301.

The fact that the young are born covered with down does not affect the case seriously, if at all, it being well known that many true Altrices (as *Falconidæ*, *Strigidæ*, *Cathartidæ*, *Procellariidæ*, *Laridæ*, etc.) make their first appearance to the light in the same condition; nor does the circumstance that the eggs are Plover-like, since those of some Altrices (especially the Gulls) are eminently so.*

The remaining forms which have usually been referred to this Order, or which appear to be closely allied to its members, are the genera *Scopus*, Briss., *Dromas*, Payk., *Anastomus*, Bonn., *Hiator*, Reich., and *Balæniceps*, Gould, all of which are confined to the Eastern Hemisphere, the two former and the last belonging to Africa, the other to India. I have seen none of these forms, and with the exception of *Balæniceps*, the literature regarding their anatomical and osteological structure is so meagre that I have been unable to glean any facts of service in this connection; I will therefore pass them by, with the remark that, with the exception of *Dromas*, which seems to be a Plover-like form, they seem to be of Ciconine affinity, and *probably* are true *Herodiones*.

As to *Balæniceps*, there has been much diversity of opinion, even among those who have examined critically both its internal and its external structure. Authors generally agree, however, that it is either more nearly related to the Storks, the Herons, or the Pelicans. It is stated, by the collector of the living specimens which were sent to the London Zoological Society (*cf.* Proc. Zool. Soc. Lond. 1860, 195),

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*Assuming, then, that the true position of this aberrant family is with or very near the *Herodiones*, its characters may be defined as follows:—

Bittern-like birds, with the tail very long and broad (nearly equal to the ample wing in length); straight, rather obtuse bill; slender, close-feathered neck; Heron-like legs and feet (except that the hallux is slightly elevated and the middle claw destitute of lateral pectinations); the plumage soft, and ornamented by beautiful *picturæ* on the remiges and rectrices. Rectrices twelve; powder-down tracts uropygial, consisting of only one pair.

Bill with the upper and lower outlines somewhat depressed, but parallel, for the basal two-thirds, the terminal portion gently convex; nasal fossæ broad and deep, and extending as far forward as the straight portion of the bill. Lores densely feathered; plumage of the neck short and rather downy; no ornamental plumes. Middle toe considerably shorter than the tarsus, its claw without lateral pectinations; lateral toes considerably shorter, the outer decidedly the longer; hallux slender, about equal in length to the basal phalanx of the inner toe, its base elevated slightly above the basal articulation of the anterior toes; bare portion of the tibia about equal in length to the outer toe.

that the young of this bird runs about as soon as hatched! In view of this statement, it becomes necessary to either remove *Balæniceps* from the *Herodiones*, or doubt the veracity of the collector—either horn of the dilemma being equally precarious. Referring the reader, then, to the main literature on this subject,[*] I leave the question of the affinities of this remarkable form in abeyance.

ARDEIDÆ.—The True Herons.

Synopsis of the American Genera.

Subfamily Ardeinæ.—Outer toe equal to or decidedly longer than the inner. Claws short, generally strongly curved. Three pairs of powder-down tracts. Rectrices lengthened, stiffish, twelve in number (except in *Zebrilus.*)

Subfamily Botaurinæ.—Outer toe decidedly shorter than the inner. Claws long, slender, slightly curved. Two pairs, only, of powder-down tracts. Rectrices very short, soft, only ten in number.

Subfamily Ardeinæ.

A.—*Rectrices twelve; tibiæ with the lower portion more or less naked.*

a. *Pectoral and inguinal powder-down tracts widely separated.*

§. *Malar region completely feathered* (except in *Pilherodius*, where anterior part is bare). *Bill shorter than the tarsus and middle toe* (usually shorter than, or about equal to, the tarsus).

1. Ardea.—Size very large. *Adult* with scapular plumes elongated, narrowly-lanceolate, and with compact webs; *in the breeding season*, the occiput with two long, slender, compact-webbed, pendant plumes. Color mainly plumbeous- or slate-blue (rarely—*e. g.* white phase of *A. occidentalis*—wholly pure white). Culmen shorter than the middle toe.
2. Herodias.—Size large, but smaller than the species of the preceding genus. *Adult* with the scapular plumes greatly elongated, reaching far beyond the end of the tail, the shafts thick and rigid, the webs decomposed, hair-like, and distant. Color entirely pure white.

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[*] Von Müller, Dr. Baron J. W.—*Balæniceps rex, Gould.* <Jardine's Contr. Orn. 1852, 91. [Translated from Naumannia, May, 1852.]

Petherick, John, F. R. G. S., H. M. Consul for the Soudan.—*Memoranda on the Hippopotamus and Balæniceps, recently imported to England, and now in the Gardens of the Society.* < P. Z. S. 1860, 195.

Bartlett, A. D.—*Note on the Balæniceps rex.* <P. Z. S. 1860, 461.

—— *On the Affinities of Balæniceps.* < P. Z. S. March 26, 1861, 131.

Parker, W. K., Memb. Micr. Soc.—*Abstract of Notes on the Osteology of Balæniceps rex.* <P. Z. S. 1860, 324.

Parker, W. Kitchen, Mem. Micr. Soc.—*On the Osteology of Balæniceps rex* (Gould). <Trans. Zool. Soc. Lond. iv. 1862, 269–351, pls. lxiv–lxvii.

Reinhardt, Professor J., For. M. Z. S.—*On the Affinities of Balæniceps.* <P. Z. S. 1860, 377.

3. GARZETTA.—Size small. *Adult* with occipital, jugular, and scapular plumes, the latter reaching to or a little beyond the end of the tail; the shafts moderately rigid, and recurved terminally; the webs decomposed, with long, hair-like, but not distant fibres. Other plumes varying in structure, according to the species. Color entirely pure white.

4. DICHROMANASSA.—Size medium. *Adult* with the feathers of the entire head and neck, excepting the throat and foreneck, elongated, linear, lanceolate and stiffish, most elongated on the occiput and jugulum. Scapular plumes extending beyond end of tail; the shafts rigid, the webs decomposed, with rather close, hair-like fibrillæ. Color wholly pure white, or plumbeous, with or without reddish neck. Tarsus twice as long as middle toe.

5. HYDRANASSA.—Size medium. *Adult* with an occipital tuft of several elongated, lanceolate white feathers. Jugular feathers broadly lanceolate, with distinct outlines. Scapular plumes hair-like, extending a little beyond the tail. Color mainly plumbeous, with lower parts and rump white. Bill longer than tarsus.

6. FLORIDA.—Size small. *Adult* with scapular plumes elongated, extending to or beyond end of tail, linear-lanceolate, with compact webs; jugular plumes similar; occipital plumes hair-like, a few of them much elongated. Color pure white, with bluish tips to outer primaries; dark slate-blue, with maroon-colored head and neck, or variously "patched" with blue and white.

7. BUTORIDES.—Size small. *Adult* with scapular plumes elongated, compact-webbed, lanceolate, but with rounded tips. Feathers of the pileum elongated, lanceolate. Jugular plumes broad, blended. Culmen longer than tarsus; middle toe almost equal to tarsus. Color much variegated.

8. SYRIGMA.—Size medium. *Adult* with several elongated, narrow, compact-webbed, round-tipped, somewhat rigid and slightly recurved plumes on lower part of occiput. Jugular feathers soft, broad, blended. No scapular plumes. Culmen about equal to middle toe. Color much variegated, the tail and lower parts white.

9. PILHERODIUS.—Size medium. Orbits and anterior part of malar region naked. Occiput with two extremely elongated linear, compact-webbed plumes. Jugular plumes broad, blended. No scapular plumes. Color white, the crown and occiput black. Middle toe shorter than culmen; culmen shorter than occiput.

10. NYCTIARDEA.—Size medium. *Adult* with several extremely elongated linear, compact-webbed occipital plumes. No scap-

ular plumes. Jugular feathers broad, blended. Culmen about equal to tarsus; tarsus slightly longer than middle toe. Lateral outlines of bill concave; gonys nearly straight. *Adult* and young exceedingly different in plumage.

11. NYCTHERODIUS.—Size medium. *Adult* with several extremely elongated linear, compact-webbed occipital plumes. Scapular plumes elongated, narrow, round-tipped, the webs somewhat decomposed. Jugular feathers broad, blended. Culmen much shorter than tarsus (a little longer than middle toe); tarsus much longer than middle toe. Color much variegated. Lateral outlines of the bill straight; gonys very convex. *Adult* and young exceedingly different in plumage.

§§. *Malar region entirely naked. Bill longer than tarsus and middle toe.*

12. AGAMIA.—Size medium. Bill extremely elongated, narrow, and compressed. *Adult* with greatly elongated, broadly lanceolate, acute occipital plumes; lower back with similar, but more loosely webbed plumes overhanging rump. Sides of neck with recurved, sickle-shaped, narrow and acute plumes. Jugular feathers broad, blended. Tarsus nearly twice middle toe.

b. Pectoral and inguinal powder-down tracts united into a continuous strip.

13. TIGRISOMA.—Malar region and throat naked, the latter with or without a medial feathered strip. *Tarsus with hexagonal scutellæ in front.* Outer toe longer than inner; claws short, strongly curved. Plumage much variegated; feathers of neck loose, "fluffy".

B. *Rectrices ten. Tibiæ with the lower portion completely feathered. Pectoral and inguinal powder-down tracts widely separated. Malar region completely feathered.*

14. ZEBRILUS.—Size very small (among the smallest of Herons). Plumage exceedingly lax and "fluffy". Bill and feet very small. Culmen about equal to tarsus, both longer than middle toe; outer toe longest. Plumage dull, with transverse undulations of dusky and light fulvous.

Subfamily BOTAURINÆ.

15. BOTAURUS.—Size medium, or rather large. Sexes similar; young similar to adult.

16. ARDETTA.—Size extremely small (the smallest of Herons). Sexes dissimilar (in all species?); young slightly different from adult.

MONOGRAPH OF THE AMERICAN SPECIES OF THE GENUS ARDEA, LINNÆUS.

Synonymy of the Genus.

<*Ardea*, Linn. S. N. i. 1735. Type, *A. cinerea*, Linn.—Coues, Key, 1872, 267 (includes also *Herodias*, *Garzetta*, *Hydranassa*, *Dichromanassa*, *Florida*, and *Butorides*). [<Subfam. *Ardeinæ*.]—Gray, Handlist, iii. 1871, 26.

=*Ardea*, Reichenb. Handb. 1851, xvi.—Bonap. Consp. ii. 1855, 110 (includes *A. cocoi*, L., *A. cinerea*, L., *A. brag*, Geoff., *A. atricollis*, Wagl., *A. leucophæa*, Gould, *A. pacifica*, Lath., *A. herodias*, L., *A. purpurea*, L., and *A. pharaonica*, Bonap.—all typical?). [<*Ardeæ*, <*Ardeinæ*.]—Baird, Birds N. Am. 1858, 667. [<*Ardeæ*, <*Ardeinæ*.]—Bouc., Cat. Av. 1876, 49.

>*Audubonia*, Bonap. Consp. ii. 1855, 113. Type, *Ardea occidentalis*, Aud.—Baird, Birds N. Am. 1858, 667.—Gray, Handlist, iii. 1871, 27.

Characters of the Genus.

Ch.—Herons of largest size (of Stork-like stature), the adults distinguished by lengthened, narrowly-lanceolate, acute jugular and scapular plumes (the former rather rigid, the latter overhanging the wings and rump); a tuft of broad feathers on each side the breast (having a different color from adjacent parts), and, *in the breeding season*, by the presence of two or three extremely lengthened, narrow, pendant, occipital plumes.

Culmen almost straight; gonys ascending, slightly convex, about equal in length to the mandibular rami; upper and lower outlines of the bill parallel for the basal half. Mental apex anterior to half-way between point of bill and anterior angle of the eye; frontal apex a little posterior to the nostrils and a little anterior to the malar apex.* Middle toe more than half the tarsus, and about equal to bare portion of tibia; outer toe reaching to about the middle of the penultimate phalanx of the middle toe; inner toe decidedly shorter, reaching only to the second articulation of the middle toe; hallux a little longer than the basal phalanx of the outer toe; claws rather short, strongly curved. Front of tarsus with broad, transverse scutellæ, in single series, for upper half. Pileum crested, the feathers of the crown and occiput being elongated lanceolate and decurved. Primaries reaching decidedly beyond tertials. Second, third, and fourth quills nearly equal, and longest; first longer than fifth; inner webs of outer three slightly sinuated near ends.

Synopsis of the American Species.†

Common characters.—Above bluish-pumbleous, the penicillate scapular plumes more hoary; remiges and rectrices slate-color. Lower parts longitudinally striped with black and white. *Young* without any plumes, and with the colors much duller, the pattern badly defined.

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* The terms "mental apex", "malar apex", and "frontal apex" are here employed to denote the apices, or points, of the feathering of the head at the base of the bill.

† In this synopsis I include, besides the truly American species, their near relative of Europe, *A. cinerea*, the latter being itself entitled to a place in the American fauna on account of its occurrence in Greenland. Of the other species properly referable to this genus, I have seen only *A. purpurea* Linn. (also European). This seems to be strictly congeneric as to details of form, but it has a very different system of coloration.

A.—*Tibiæ and border of the wing purplish-cinnamon, or rufous.*

1. A. OCCIDENTALIS.—Pileum and occipital plumes, with rest of head, white; forehead streaked with black. *Sometimes whole plumage pure white!*[*] Culmen 6.40–6.75; tarsus 8.00–8.75; wing 19.00–21.00. *Hab.*—Florida to Southern Illinois; Cuba; Jamaica.
2. A. HERODIAS.—Pileum and occipital plumes black; forehead and central feathers of the crown white; culmen 4.30–6.25; tarsus 6.00–8.25; wing 17.90–20.00. *Hab.*—North America in general; Middle America; Galapagos; Venezuela; West Indies.

B.—*Tibiæ and border of the wing white.*

3. A. CINEREA.—Pileum and occipital plumes black; forehead and centre of crown white (as in *A. herodias*). Neck cinereous. Culmen 4.80; tarsus 6.00–6.25; wing 18.50. *Hab.*—Europe, etc. Accidental in Southern Greenland.
4. A. COCOI.—Entire pileum (including forehead, etc.) and occipital plumes black. Neck white. Culmen 5.85–6.75; tarsus 7.20–8.00; wing 18.50–19.50. *Hab.*—South America.

1. ARDEA OCCIDENTALIS.

Florida Heron; Würdemann's Heron.

a. White phase.

? "*Grus*, . . ., AUDUBON, MSS.", NUTT. Man. Orn. Water Birds, 1834, 39.[†] (Great White Crane: Florida.)

Ardea occidentalis, AUD. Orn. Biog. iii. 1835, 542; v. 1839, 596; Synop. 1839, 264; B. Am. vi. 1843, 110, pl. ccclviii. (adult).—BONAP. Comp. List, 1838, 47.—LEMBEYE, Aves de Cuba, 1850, 82 (Cuba).—GUNDL. J. f. O. iv. 1856, 341 (Cuba).—BRYANT, Pr. Bost. Soc. vii. 1859, 17.—MARCH, P. A. N. S. Philad. xvi. 1864, 63 (Jamaica; rare).—COUES, Key, 1872, 267; Check List, 1873, 89, n. 451.—SCL. & SALV. Nom. Neotr. 1873, 125, n. 3 (Cuba).

Audubonia occidentalis, BONAP. Consp. ii. 1855, 113 ("Am. S. Calid. Florida. Cumana").—BAIRD, B. N. Am. 1858, 670 (South Florida; Cuba); Cat. N. Am. B. 1859, n. 489.—GRAY, Handlist, iii. 1871, n. 10105 (South Florida; Cuba).—BOUCARD, Cat. Av. 1876, 49, n. 1374 (Florida; Cuba).

Herodias occidentalis, GUNDL. J. f. O. 1856, 340 (Cuba); 1861, 328 (Cuba).—BREWER, Pr. Boston Soc. v. ii. 1860, 308 (Cuba).

? *Great White Crane*, NUTT. *l. c.*

The Great White Heron, AUD. *l. c.*

Great White Heron, BAIRD, *l. c.*—COUES, *l. c.*

Garzon, LEMB. *l. c.*

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[*] This species, like *Dichromanassa rufa*, seems to be dichromatic. The white phase appears to be most common (?).

[†] "Of this interesting species, found by Audubon in the vast swamps of East Florida, we yet know no particulars, excepting the specific character of its being wholly white, and scarcely inferior in magnitude to the Whooping Crane, whose general habits it in all probability possesses. Since its discovery, we have, I believe, heard of a specimen having been obtained in the vicinity of Charleston, S. C."—NUTT. *l. c.*

b. Blue phase.

Ardea würdemannii, BAIRD, B. N. Am. 1858, 669 (South Florida); ed. 1860, pl. —; Cat. N. Am. B. 1859, n. 488.—MARCH, Pr. Phila. Acad. xvi. 1864. 64 (Jamaica).—COUES, Key, 1872, 267; Check List, 1873, 87, n. 450.—WYMAN, Forest and Stream, Sept. 25, 1873, 105 ("*wardemanni*").—NELS. Bull. Essex Inst. Dec. 1876, 151 (Wabash Co. Ill. Sept. 11-22, 1876).*

Florida Heron, BAIRD, *l. c.*—COUES, *l. c.*

White-crowned Heron, MARCH, *l. c.*

HAB.—South Florida (*Audubon, Baird, et Auct.*); Cuba (*Lembeye, Gundlach, Brewer*); Jamaica (*March*); Southern Illinois and Indiana (Wabash River at Mount Carmel, Illinois, September 11–22, 1876; *Ridgway, Nelson*). [Probably the whole of the Austro-riparian district.]

a. White phase (= *occidentalis*, Aud.).

Adult.—Entire plumage pure white. "Bill yellow, the upper mandible dusky green at the base; loral space yellowish-green; orbital space light blue; iris bright yellow. Tibia and hind part of tarsus yellow; fore part of tibia [tarsus?] olivaceous, sides of latter greenish-yellow; claws light brown" (AUDUBON, *l. c.*).†

Young.—Similar in color to the adult, but destitute of any plumes.

b. Blue phase (= "*würdemanni*", Baird).

Adult.—Entire head, including occipital crest, pure white; the forehead streaked with black (the feathers edged with black, the median stripe being white). Abdomen and crissum pure white, the former sparsely streaked with black (these streaks on the inner edge of the feathers, and broader anteriorly); crissum immaculate. Neck deep violaceous-drab (darker and more violaceous than in *A. herodias*, and ending almost abruptly against the white of the head); the throat with a narrow series of black and rufous dashes on a white ground; plumes of the lower neck white, most of them edged with black, but the longer without grayish tinge. Lateral jugular tufts blue-black, with wide median stripes of pure white. Upper parts exactly as in *A. herodias*, except that the lower wing-coverts have conspicuous median streaks of white, while the edge of the wing from the carpus back is *white*, tinged with rufous, instead of *wholly rufous*. Tibial feathers paler rufous than in *A. herodias*, growing almost white next the body on the inner side.

Naked tibiæ *yellow;* under side of toes *yellow;* rest of legs and feet *yellowish-olive.*

Wing 21.00; tail 8.00; culmen 6.45; depth of bill (through middle of nostrils) 1.15; naked portion of tibia 5.50; tarsus 8.00; middle toe 4.80. [Type, No. 8690, South Florida.]

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* *Fide* R. Ridgway, *in epist.*

† "Iris yellow; orbits yellowish-green; bill yellow, greenish at the base; legs yellow, with olive tinge in front; claws light brown." Length 45; expanse 68 or more; flexure nearly 20; leg nearly 9; bill 5½ inches (MARCH, *l. c.*).

Young.—Similar to young of *A. herodias*, but lesser wing-coverts widely tipped with bright ferruginous, producing thereby a conspicuous spotting of this color; all the lower wing-coverts, large and small, with a large, terminal, wedge-shaped spot of white. Forehead and crown dusky slate-color; most of the feathers with whitish shafts; occipital plumes all whitish at the base, only the ends being dusky.

That the specimen described above as the young of *A. "würdemanni"* really belongs to that species, there is no reasonable cause to doubt. Although a very young bird, with the downy filaments still adhering to the tips of all the feathers of the crown, and with the remiges only half grown out, it is much larger than any specimens of *A. herodias* of corresponding age that I have seen, the culmen measuring 5.15, the tibia 5.00, the tarsus 7.80, and the middle toe 4.60. The plumage affords even more satisfactory evidence: In the young of *A. herodias*, the dusky of the crown includes the entire upper half of the head, the occiput being wholly blackish and the cheeks slaty; in the specimen under consideration the cheeks are entirely white, like the throat, and the occipital feathers white, tipped with dusky, thus restricting the continuous dusky to the forehead and crown. The conspicuous white spots on the wing-coverts agree with the similar but smaller markings seen in the adult of *A. würdemanni*, but which are wanting in all ages and stages of *A. herodias*.

Observations.—The above synonymy and description of "*Ardea occidentalis*" may appear to some unwarranted; but that the step has been taken only after the most careful investigation and mature deliberation, will we think become evident upon perusal of the following explanatory remarks:—

Remarkable as the case may seem, it is generally conceded, I believe, that the white-plumaged bird known as Peale's Egret (*Ardea pealei* Bonap.) and the bluish- and reddish-colored bird called the Reddish Egret (*Ardea rufa* Bodd.) are one and the same species; and, furthermore, that these widely different phases of plumage of the same bird do not depend in the least upon age, sex, nor season, but that each is characteristic of an individual through life. In order to place before the reader the main facts of the case, we transcribe in full a comprehensive review of the subject, by Dr. T. M. Brewer, published some three years since in the American Sportsman.*

"If to any one the above question may seem absurd, I refer all such to the facts given below. While I cannot, from my own experience, confirm their correctness, I believe implicitly in the indorsing of my informant. They seem to point to the only satisfactory explanation of one of the most remarkable anomalies in one of our North American species on record.

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*"Are Peale's Egret Heron and the Reddish Egret identical species?" <American Sportsman (West Meriden, Conn.), Feb. 6, 1875, 294.

"In a state of domestication, as we are well aware, we constantly notice a great variety in the colors of birds of the same kind. In the same brood of chickens we see black and white, speckled and plain, all evidently the progeny of the same stock. Similar variations are noticeable in the domestic duck, which is the progeny, by long descent, from the wild mallard, which never varies when in its undomesticated life. Yet no rule has been supposed to be more unvarying than that all wild birds present certain uniformities of size, shape, bill, leg, colors and the like, by which science establishes orders, genera and species. Each particular species of birds, and there are some twelve thousand or more, now recognized in the world, has been supposed to present the same uniform appearance as to size, shape and marking. There are, of course, great variations caused by age, sex and season. The same ptarmigan is red in summer and pure white in winter. The same species of heron is white in youth and bright cerulean blue in maturity; the same water-rail is jet-black in early life and of brighter colors in age; the same South American *Formicariidæ* are black if they are males, but of the color of a dead leaf if they are of the gentler sex. The male Bob-o-link is bright black and white, and is strikingly beautiful in July. In August the same male Bob-o-link cannot be distinguished from his homely wife. These are striking exceptions to general rules, but they are also as universal as the rules themselves. They form a part of them, and in time we come to know them, and cease to regard them as at all remarkable.

"In this connection I take no notice of the anomalies now known as albinisms and melanisms, whereby we hear of black birds that are white, and of red squirrels that are black. That is another form of anomaly exceedingly curious, and which 'no feller can find out,' but which has no connection with my present subject. That is occasional—erratic like a comet. My case is like a fixed star, unvarying in its ever varying eccentricity. We have in the southern portions of the United States a species of heron known to our authors as the Reddish Egret. The head and neck are of a chestnut-brown, and its body is of a grayish blue. In scientific language it is the *Demiegretta rufa* or *rufescens*. Its existence has been known in the scientific world since 1783.* We have in precisely the same localities another form, identical in size, that is of a uniformly pure white color. This bird was first described in 1828 by Bonaparte, as the Peale's Egret Heron, and was for a while regarded as a distinct species.

"Mr. Audubon, in his excursions to Florida, was led to the conclusion that these two forms of heron were, in reality, one and the same species, and that the white Peale's Egret is only the young of the Reddish Egret; and accordingly we find in his great work, and again in his smaller edition, these two forms given as the young and the old birds of one and the same species. This conclusion was formed on a hasty basis, and was not confirmed by subsequent observations. Even Mr. Audubon, in his edition of 1843, tells us that he caught some of the young white birds and took them to Charleston; and although one of these birds lived to be three years old, it obstinately refused to put on, what Audubon tells us is, its mature plumage, as it ought to have done if it was ever going to do it. It is singular that this fact never gave to Mr. Audubon a revelation of the actual and only explanation of the facts he witnessed and narrates—that the two birds live together as members of one family.

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* By a typographical error, printed "1874" in the original.

"In 1848 Dr. William Gambel of Philadelphia, a young ornithologist of exceeding promise—the beauty of whose private worth was not surpassed by the bright promises of a scientific future, alas too soon shut out by his early death—visited Florida, and apparently quite upset Mr. Audubon's conclusions. At any rate he found some of the brown-necked herons having brown-necked young ones, and some of the White Egrets having white young ones. And very naturally he concluded that Audubon had been imposed upon, or had imposed upon others, and that the two forms were two totally distinct species of heron. The scientific world accepted his conclusions, and from that time forth we find Peale's Egret Heron and the Rufous Egret Heron taking their places in our systems as two totally distinct and separate species. But alas for the uncertainty of science. Dr. Gambel was, after all, as hasty in his conclusions as Mr. Audubon, and quite as far from the true solution of this problem; and the regret with which I have always thought of his early death, is deepened by the wish that my friend could have lived to read and to see the solution of this vexed question.

"Mr. N. B. Moore, a gentleman of culture and observation, whose health has required his residence in Florida for several years past, and whose knowledge of Ornithology has made him a competent witness, has had his attention called to this question, and his explanation reaches to the root of the whole problem. His letters addressed to my friend, Prof. Baird, have been placed in my hands, and from them I gather these conclusions: First, that all Mr. Audubon's facts may have been correctly stated, and yet his inferences not correctly drawn; second, that Dr. Gambel's facts may, also, all have been truly given, and his conclusions equally incorrect. The white birds are not exclusively the young of the brown and blue birds; and, although, in some instances, the white bird may have white young and the blue bird may have blue children, they are not, nevertheless, two species, but one. Mr. Moore shows that, in some instances, he has known a pair of the blue heron to have children one white and the other blue. He has known the blue to mate with the white and the white with the blue, and some to have children of opposite colors from their own. In fact, that they are one and the same species whether the color be blue or white. The color has no specific significance. It denotes neither species, sex nor age. Parents do not, in all cases, bequeath their own color to their children. Yet there are no mixtures. They are either entirely the one or the other.

Mr. Moore who, as I have said, is a man of great observation, brings another interesting evidence of the unity of species in these two forms. He has noticed that where a number of herons are feeding in the same waters each will tolerate the near presence of other birds, provided they are all of different species. The Great White Egret, the Great Blue Heron, the Little Blue, the Snowy and others will all peacefully feed side by side, but let another bird of any one of the same species come and immediately its own near relative, will at once attack it and drive it away to a respectful distance. No heron will permit, when feeding, the near presence of one of its own species. Tried by this test, the Blue and Brown Egrets and White Egrets belong to the same family, for no one of either of these birds will suffer the near presence, when it is feeding, of either of these two forms, whether white or blue.

"This then appears to be the present explanation of facts that have appeared so inconsistent and contradictory. We need not presume that Audubon was imposed upon, still less that he sought to impose upon us. We can accept Dr. Gambel's facts as well as Mr. Audubon's, and believe in the truth of both. But we are not yet enabled to say what significance, if any, these different colors possess. It remains as great a puzzle in this respect as ever.

"Yet it is not wholly unexampled. Our common Screech Owl, *S. asio*, appears in two very different styles of plumage. Some are red and some are brown. It was once supposed to be significant of age. The red plumage was regarded as the young, and the brown as the color of the mature bird. Audubon so figures them. Our good friend, Dr. Sam Cabot, in his younger days shot an old bird in the red plumage, feeding some young in the ashy brown dress, and he naturally concluded that Audubon had put the horse where the cart ought to go. But others, who had different experience, would not accept his conclusions. At length it was discovered that in one sense both were right, and in another that both were wrong. Old birds are both red and brown, and young birds are both brown and red, and both are of the same species, the color having no significance that we can as yet determine."

Mr. Moore's observations, as stated above, afford conclusive evidence that *Ardea rufa* and *A. pealei* Bonap. are one and the same species. That these two distinct phases represent a sort of dichromatism analogous to that of the little Screech Owl, but differing in that the departure from the normal coloration exhibits itself in another color (pure white instead of rufous), I consider unquestionable. This kind of dichromatism appears to be nearly if not quite peculiar to the Heron tribe (I can recall no instance among other birds), and is characteristic of several species, among which, besides the present one, are *Demiegretta sacra* (Gmel.) of India, Australia, etc., *Florida cærulea* (Linn.), and, as I think is quite capable of demonstration, *Ardea occidentalis* Aud.

In the case of other sorts of dichromatism (that is, where other colors than white are substituted for the normal dress), it is well known that the difference between the extreme phases varies greatly in degree among species of the same genus, or genera of the same family. Thus, among Owls (in which family the condition known as "erythrism"* is most developed), *Glaucidium gnoma* varies from brownish-gray to deep sepia- or umber-brown, the pattern remaining distinct, while *G. ferrugineum*, with a very similar normal dress, has its rufescent extreme a very bright brick-red color, with the markings almost if not quite obliterated; *Syrnium aluco* of Europe has also its grayish (normal) and rufescent (erythrismal) phases about equally marked, as has also the American *Scops asio;* but none of the American species of *Syrnium* (of which there is a considerable number) tend to erythrism, nor does the European *Scops* (*S. zorca*). The same is also the case with the American Falconine genus *Micrastur* (one of the very few *Falconidæ* in which this variation presents itself), one species (*M. ruficollis*) having the two extremes almost as strikingly different as in the Owls above named, while in another (*M. concentricus*) there is not the slightest tendency to erythrism,—other species being variously intermediate. From what is known of *Scops asio* and other Owls, it is also evident that the presence or absence of erythrism has more or less of a geographical significance, this species being *never* rufous, so far as known, in any part of the Western Province of the United States, while this bright rufous plumage is the rule in the Eastern States, particularly to the southward.† It is also a fact to be borne in mind that although the *extreme* phases characterize a very large majority of the individuals of a species, *intermediate* specimens are by no means wanting; they are, however, the rare exception.‡

It may be further stated that, as the condition of melanotic dichromatism§ is subject to precisely the same rules as that of erythrism, it is unnecessary to further extend the discussion of that subject. But, as a matter exceedingly pertinent to the relationship between *Ardea occiden-*

Conf. August von Pelzeln *in* "Novara-Expedition, Zoologischer Theil, Bd. I: Vögel", pp. 14–25, where various color-variations are discussed under head of "Über Farbenabänderungen bei den Falconiden".

†In the Austro-riparian region (including, besides the Gulf States, the lower Mississippi Valley to Southern Illinois and Indiana), the proportion of red to gray individuals of this species is at least as 90 to 100; or, in other words, ninety of every one hundred specimens represent the rufous phase; taking into account with this fact the apparent *total absence* of this plumage among the Western birds, the geographical signification becomes very evident.

‡Dr. Brewer has, therefore, erred slightly in saying that "There are no mixtures. They are either entirely the one or the other."

§In birds, the conditions which I propose to term melanotic, albinotic, and erythrismal dichromatism are of rather limited application; the first being especially characteristic of the *Falconidæ* and *Procellariidæ*, the second of the *Ardeidæ*, and the third of the *Strigidæ*. Both of the former are to be distinguished from those accidental abnormalities, true melanism and albinism, which are of only occasional occurrence, and connected with some physiological derangement.

talis Aud. and *A. würdemanni* Baird, and as probably affording additional evidence of their identity, it is desirable, after having disposed of *Dichromanassa rufa*, to call *Florida cœrulea* into the case. It has, up to the present time, been supposed that in this species the adult was invariably blue, while the young was as constantly white. This, however, is not the case. I have recently examined a number of specimens of this species in the white plumage, which possessed, in full development, the ornamental plumes of the adult. This proves that the species is, in a measure, dichromatic; but in its dichromatism it differs from others of the family in these remarkable respects: I have yet to see a specimen in the white plumage, whether young or adult, (and I have carefully examined dozens), which did not, in addition to the bluish tips to the outer primaries, show more or less of a tinge of this color on other parts of the plumage, particularly on the top of the head, which usually, if not always, is tinged with a faint pearl-blue wash,—sometimes exceedingly faint and delicate, but apparently always present. *On the other hand, I have never seen a specimen in the blue plumage which was not unmistakably an adult!* It would therefore seem that while this species is rarely if ever blue in its first plumage, some individuals only partially assume the blue livery, while others remain white through life!

Now, as to *Ardea occidentalis* and the so-called *A. würdemanni*:—In his description of the latter, Professor Baird called attention to the extreme similarity of these two presumed species, in general dimensions and proportions, particularly of the bill, although at the same time, following Bonaparte, he placed them in different genera,—remarking at the same time, however, that they did not seem to him separable by sufficient characters. Later authors, with few exceptions (mostly those who have observed the bird in nature), have referred it to *A. herodias*, either as simply a particular plumage of that species or as an abnormal variation. Professor Baird has himself suggested the possibility of its being a hybrid between *A. occidentalis* and *A. herodias*.

The bird named *A. würdemanni* appears to be much less known than the white *A. occidentalis*, hence we may infer that the white plumage is the rule, and the colored plumage the exception. Audubon found his *A. occidentalis* in immense numbers amongst the keys and mangrove-lined shores of South Florida, but he was entirely ignorant of the existence of *A. würdemanni*. Even subsequent observers in Florida have found the latter to be exceedingly rare, if, indeed, they discovered it at all. As long ago as 1864, however, it was well known as a Jamaican bird to Mr. Thomas H. March, who thus writes of it in his "Notes on the Birds of Jamaica", published in the Proceedings of the Academy of Natural Sciences (1864, p. 64):—

"275. *Ardea würdemannii ?*—The White-crowned Heron is in the upper plumage very like the preceding [*A. herodias*], but has the crown and occipital elongated feathers white; the under parts white, streaked with black; the breast bluish black, with bluish gray or ashy on the sides.

Length nearly 50 inches, expanse 75 or more, flexure 21, leg 8, middle toe about 13 [1*], thigh 9, bill 6½, greenish brown above, yellowish beneath.

"The fishermen and gunners on the coast say this is the male of the preceding species [*A. herodias*] in summer plumage, but, from two specimens I have collected I think they are quite distinct."

As a Florida bird it has more recently been recorded by Mr. J. Francis Le Baron, C. E., who announces, in the number of *Rod and Gun* for November 11, 1876 (p. 83), the capture of a specimen of this bird near the head of Indian River, Florida, in March, 1875. His account is as follows:—

. . . "By carefully paddling the boat around the points I surprised and shot a few Grebes and Gallinules and was fortunate enough to see, through the grass, at one of the points, a large heron standing in the water. I at once fired and shot it and upon examination soon found that it differed from any previously obtained. It was a beautiful bird, of a bluish ash-color above, with reddish on the wings and legs. The head was pure white with a black spot in the centre of the forehead, and with long white plumes on the head bending gracefully back. The throat was also white streaked on the sides with black and red. It measured sixty inches in length, and proved to be the rare Florida or Würdemann's Heron (*Ardea würdemanni* †) of which only two specimens, it is believed, had ever been taken before. The capture of this elegant bird well repaid all the hardships of the previous night."

The last record of *A.* "*würdemanni*" is, I believe, that by Mr. E. W. Nelson, in the Bulletin of the Essex Institute (Dec. 1876, p. 151), where it is given as an inhabitant of the Lower Wabash Valley, in Illinois and Indiana, on the strength of a communication to that effect from myself. I observed the bird at the Grand Rapids, near Mount Carmel, Illinois, at intervals between the 11th and 22d of September, 1876; but whether there were several specimens, or whether merely the same individual was seen several times, I am not certain, although circumstances favored the former supposition. The bird was observed, generally in the afternoon, standing in the shallow water of the rapids in the middle of the river (here about 1,200 feet wide), entirely out of shotgun range from either shore. Even from this distance it was readily distinguishable from the Common Blue Heron (*A. herodias*), numbers of which waded about in other parts of the river, by its superior size, generally lighter plumage, and conspicuously white head—there being no black whatever visible. The only chance to approach it was by taking advantage of the remains of an old dam, which reached out from the shore nearly to where the bird was standing; this was accomplished with such success that the bird was approached to within some fifty yards, from which point such a satisfactory view was obtained as to leave no doubt whatever that it was the true *würdemanni*, the writer being perfectly familiar with the characters of the species, having many times handled the type-specimen. Owing to the excitement of the moment, and perhaps also to the distance, a shot at the bird as it flew was uneffectual; and the attempt of a friend, on another occasion, to kill it (or another individual) under the same circumstances only resulted in severely wounding it, when it managed to reach the opposite shore, where it alighted in the top of a tall dead tree upon the bank of the river. During the past summer (June, 1877), the writer visited the cypress-swamps about three miles from the scene of the above, in order to determine, if possible, whether *A. würdemanni* was to be found in the vicinity of a large colony of *A. herodias*, which had been frequented for years by these birds. The result was unsatisfactory; for although one which was believed to be this species was shot at on the wing and fatally wounded, it did not fall until so far from us that it could not be found, although it was heard to crash through the branches and strike heavily upon the ground.

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* An evident error.

† In the original, these names are spelled "Windeman's Heron (*Ardea windemani*)".

From the above it may be reasonably inferred that while the bird known as Würdemann's Heron exists in very few collections, it is of more frequent occurrence and wider distribution than has generally been supposed. It is also equally probable that it is nothing more nor less than the normal or colored phase of plumage of *Ardea occidentalis* Aud. From what is known of the other species in which dichromatism is apparent, it becomes evident that this condition is developed in a peculiar way in almost every species. Thus, in *Demiegretta sacra* and *Dichromanassa rufa*, individuals are white or colored, as the case may be, from the nest up, while examples at all intermediate are excessively rare. In *Florida cœrulea*, on the other hand, specimens to some degree intermediate are very numerous; it is also a peculiarity of this species that it seems never to be blue in its first plumage, many individuals which are white in youth changing to blue later in life, while others retain through life the colors they first assumed! Who, then, in view of these facts can offer reasonable objection to the theory that *Ardea occidentalis* is likewise represented by two distinct phases of plumage, of which the white is by far the more common, the normal or colored phase ("*würdemanni*") being very rare—perhaps becoming extinct? I am not aware that *Herodias egretta* is ever any color but pure white all over; nor have I ever seen a white specimen of *Ardea herodias*; yet of this latter species I have seen an example whose plumage was characterized by the admixture of white feathers. This circumstance may have no more important significance than a mere individual tendency to albinism; but I am inclined to look upon it rather as denoting either the dawn or close of an era of dichromatism—upon which the species may be just now entering, or may have recently left.

List of specimens examined.

a. WHITE PHASE.

Catalogue number.	Museum.	Sex and age.	Locality.	Date.	Wing.	Tail.	Culmen.	Depth of bill.*	Bare portion of tibia.	Tarsus.	Middle toe.
1965	U. S.	Juv.	Florida..............	....	....	.....	.....	.....	.....	.....	....
6840	U. S.	♂ Juv.	Florida (Indian Key)	Mar. 18	20.00	8.00	6.40	1.15	5.90	8.75	5.0

b. COLORED PHASE.

Catalogue number.	Museum.	Sex and age.	Locality.	Date.	Wing.	Tail.	Culmen.	Depth of bill.*	Bare portion of tibia.	Tarsus.	Middle toe.
6539	U. S.	Juv.	Indian Key, Florida†	....	....	.....	.....	.....	.....	.....	....
8690	U. S.	♂ ad.	South Florida........	....	21.00	8.00	6.45	1.15	5.50	8.00	4.80
9407	U. S.	Juv.	Florida..............	....	....	.....	.....	.....	.....	.....	.....

*Through middle of nostril. † Length, 49.00; extent, 70.00; wing, 20.00 (*Würdemann*).

The measurements of the two forms as compiled from various authorities may be thus compared, showing their essential agreement:—

	Total length.	Expanse of wing.	Wing.	Culmen.	Tarsus	Middle toe.
A. occidentalis....	45.00–54.00	75.00–83.00	19.00–19.50	6.50–6.75	8.50	4⅝
A. würdemanni...	49.00–50.00 (nearly)	70.00–75.00+	19.70–21.00	6.50	8.00	....

ARDEA HERODIAS.

The Great Blue Heron.

Ardea fusca canadensis, Edwards, Nat. Hist. 1743–51, pl. cxxxv.

Ardea Americæ septentrionalis, Edw. *l. c.*

Ash-coloured Heron from North America, Edwards, *l. c.*

Ardea freti-hudsonis, Briss. Orn. v. 1760, 407, n. 7 (= *juv.*).

Ardea virginiana cristata, Briss. *t. c.* 416, n. 10.

Le Héron de la Baye de Hudson, Briss. *l. c.*—Vieill. N. D. xiv. 1817, 408.

Ardea herodias, Linn. S. N. ed. 10, 1758, 143, n. 11 (based on Edwards, *l. c.*); ed. 12, i. 1766, 237, n. 15.—Scop. Bemerk. ed. Günth. 1770, 98, n. 118.—Gmel. S. N. I. ii. 1788, 630, n. 15 (*ex* Briss. *l. c.*).—Lath. Ind. Orn. ii. 1790, 692, n. 56 (Arctic Zoölogy, ii. 234; Gen. Synop. v. 85).—Bartram, Travels, 1791, 293.—Turt. S. N. i. 1806, 378 (Virginia).—Wils. Am. Orn. viii. 1814, 28, pl. lxv. f. 5.—Vieill. N. D. xiv. 1817, 408.—Temm. Man. ii. 1820, 566.—Bonap. Journ. Phila. Acad. v. 1825, 59 (critical); Obs. Wils. 1825, n. 183; Ann. N. Y. Lyc. ii. 1826, 304; Synop. 1828, 304; Comp. List, 1838, 47; Consp. ii. 1855, 112.—Sw. & Rich. F. B. A. ii. 1831, 373 (rare in fur countries.)—Less. Traité, i. 1831, 576 (adult).—Nutt. Man. Water Birds, 1834, 42.—Aud. Orn. Biog. ii. 1835, 87; v. 1839, 599, pl. 211; Synop. 1839, 265; Birds Am. vi. 1843, 122, pl. ccclxix (adult).—D'Orb. Ois. Cuba, 1839, 199.—Peab. Rep. Orn. Mass. 1839, 362.—Giraud, Birds L. I. 1844, 276.—Darwin, Voy. Beagle, iii. Birds, 1838–41, 128 (Galapagos).—Cass. P. A. N. S. iii. 1846, 137 (habits); *ib.* 1860, 196 (Rio Atrato, New Granada).—Denney, P. Z. S. 1847, 39.—Gosse, Birds, Jam. 1847, 346.—Jard. Contr. Orn. 1848, 85 (Bermudas; winter resid.; sometimes whole year).—Woodh. Sitgreaves's Exp. 1853, 97 (Ark.; Texas; New Mex.).—Thomps. Nat. Hist. Vermont, 1853, 103, fig.—Wailes, Rep. Mississippi, 1854, 321.—Hartl. J. f. O. 1854, 170 (Galapagos).—Henry, P. A. N. S. vii. 1855, 316 (New Mexico); xi. 1855, 108 (New Mexico).—Kennicott, Trans. Ills. Agr. Soc. i. 1855, 587 (Illinois).—Pratten, *ib.* 607 (New Mexico).—Putnam, Pr. Essex Inst. i. 1856, 218 (Mass.; in summer).—Gundl. J. f. O. iv. 1856, 340 (Cuba; breeds).—Newb. Pacific R. R. Rep. vi. 1857, 97 (Calif.; common).—Thienem. J. f. O. 1857, 155 (Cuba; descr.

egg).—Baird, B. N. Am. 1858, 668 (entire U. S.; West Indies.); Cat. N. Am. B. 1859, n. 487.—A. & E. Newton, Ibis, i. 1859, 263 (St. Croix, W. I.; breeding?).—Scl. & Salv. *ib.* 220 (Guatemala); P. Z. S. 1859, 226 (Guatemala); 1870, 323 (Galapagos); 1873, 511 (Venezuela); Nom. Neotr. 1873, 125 (Mexico; Venezuela; Antilles).—Bryant, Pr. Bost. Soc. vii. 1859, 120 (Bahamas).—Max. J. f. O. 1859, 86 (descr. etc.).—Martens, *ib.* 219 (Bermudas).—Willis, Smithsonian Rep. for 1858 (1859), 284 (Nova Scotia).—Heermann, Pacific R. R. Rep. x. 1859, pl. vi. 63 (California).—Coop. & Suckl. Pacific R. R. Rep. xii. ii. 1860, 228 (Puget Sound).—Wheaton, Ohio Agric. Rep. 1860, n. 185; *ib.* 1874,— (Ohio; summer; very common).—Brewer, Pr. Bost. Soc. vii. 1860. 308 (Cuba); Pr. Boston Soc. 1875, 446.—Scl. P. Z. S. 1861, 81 (Jamaica)—Albrecht, J. f. O. 1861, 155 (Bahamas).—Gundl. *ib.* 338; 1862, 82 (Cuba).—Barnard, Smithsonian Rep. for 1860 (1861), 433 (Chester Co. Penn.).—Taylor, Ibis, iv. 1862, 129 (Florida).—Hayden, Rep. 1862, 173.—Boardm. Pr. Boston Soc. ix. 1862, 128 (Maine; common; breeds).—Verrill, *ib.* 138 (Anticosti); Pr. Essex Inst. iii. 1862, 152 (Oxford Co. Maine; breeds).—Coues & Prentiss, Smithsonian Rep. for 1861 (1862), 415 (Dist. Col.; in summer).—Lawr. Ann. Lyc. N. Y. viii. 1863, 12 (Isth. Panama); *ib.* viii. 1864, 99 (Sombrero, W. I.); viii. 1866, 292 (vic. of New York City); ix. 1869, 142 (Costa Rica); *ib.* 216 (Merida, Yucatan); Pr. Boston Soc. 1871,—(Tres Marias, W. Mexico; rare); Mem. Bost. Soc. ii, 1874, 310 (Mazatlan; Tres Marias: resident); Bull. Nat. Mus. n. 4, 1876, 48 (Tehuantepec City).—Blakiston, Ibis, v. 1863, 129 (Saskatchewan).—Allen, Pr. Essex Inst. iii. 1864, 76 (Massachusetts; breeds); Mem. Bost. Soc. i. 1865, 501 (Iowa); *ib.* 1874, 67; Bull. M. C. Z. ii. 1871, 356 (Florida); iii. 1872, 182 (Kansas; Utah).—March, Pr. A. N. S. Phila. xvi. 1864, 63 (Jamaica; abundant).—Salvin, Ibis, 1865, 193 (Guatemala); Trans. Zool. Soc. ix. 1875, 497 (Galapagos).—Hoy, Smithsonian Rep. for 1864 (1865), 438 (Missouri).—Coues, Pr. A. N. S. Phila. 1866, 95 (Ft. Whipple, Arizona): Ibis, 1866, 263 (Colorado River); *ib.* 269 (Southern Calif.); Pr. Essex Inst. 1868, 289; Pr. A. N. S. Phila. 1871, 33 (Fort Macon, N. C.); Key, 1872, 267; Check List, 1873, 87, n. 449; B. N. W. 1874, 517.—Caban. J. f. O. iv. 1856, 348 (Cuba).—Dresser, Ibis, 1866, 31 (S. Texas).—McIlwr. Pr. Essex Inst. v, 1866, 91.—Butcher, Pr. A. N. S. Phila. 1868, 150 (Laredo, Texas).—Brown, Ibis, iv. 1868, 424 (Vancouver I.).—Sundev. Oefv. Vet.-Ak. Forh. 1869, 58 (St. Bartholomew, W. I.).—Cooper, Am. Nat. iii. 1869, 82.—Stearnes, *ib.* 401.—Turnb. B. E. Penn. 1869, 37; Phila. ed. 28.—Frantzius, J. f. O. 1869, 376 (Costa Rica).—Dall & Bann. Tr. Chicago Acad. i. 1869, 289 (Sitka; rare).—Mayn. Nat. Guide, 1870, 143 (Mass.); Pr. Boston Soc. 1871,—(New Hampshire); xiv, 1872, 383.—Gray, Handlist, iii. 1871, 27, n. 10104 (United States; West Indies).—Trippe, Pr. Boston Soc. xv. 1872, 240 (Iowa).—Aiken, *ib.* 209.—Grayson, *ib.* 285 (Tres Marias).—Ridgw. Am. Nat. vi. 1872, 731; Bull. Essex Inst. Jan. 1875, 39 (Nevada); Field and Forest, June, 1877, 211 (Colorado); Orn. 40th Par. 187–, 327, 330, 341, 369, 390, 616 (Sacramento, Cal.; Truckee Valley, Nevada: breeding on "The Pyramid", Pyramid Lake).—Snow, Birds Kansas, 1873, 9.—Trippe, Pr. Bost. Soc. xvi, 1873, 240.—Scott, *ib.* 227.—Merriam, U. S. Geol. Survey Terr. 1873, 715; Am. Nat. 1874, 89.—Henshaw, Ann. Lyc. N. Y. xi. June, 1874,—(Utah; resident); Orn. Wheeler's Survey, 1875, 464 (Lowell, Ariz.); *ib.* 1876, 273 (coast Southern Cal.; abundant).—Nelson, Bull. Essex Inst. viii, Dec. 1876, 131, 153 (N. E. Ills. Apr. to Dec.).—Bouc. Cat. Av. 1876, 49, n. 1373 (N. Am.; W. I.).—Langdon, Cat. Birds Cinc. 1877, 15.

Ardeola herodias, Albrecht, J. f. O. 1862, 206 (Jamaica).—Hurdis, Contr. Orn. 1850, 11 (Bermudas; resid.; breeds).

Ardea hudsonias, Linn. S. N. i. 1766, 238, n. 18 (based on *Ardea freti-hudsonis*, Briss. l. c.).—Gmel. S. N. I. ii. 1788, 632, n. 18.—Lath. Ind. Orn. ii. 1790, 693, n. 57.—Turt. S. N. i. 1806, 379 (*Red-shouldered Heron*; North America).

Red-shouldered Heron, LATH. Synop. iii. 1785, 86 (quotes *Ardea hudsonias*, Linn. *l. c.*; *Le Héron de la Baye de Hudson*, Briss, *l. c. et* Buff. *l. c.—Ash-coloured Heron, from America*, Edw. *l. c.*).—PENN. Arct. Zool. ii. 1785, 444, n. 342.
The Great Bluish Grey Crested Heron, BARTRAM, Travels, 1791, 293.
Great Heron, NUTT. Man Water Birds, 1834, 42.
The Great Blue Heron, AUD. *l. c. et auct.*
Grand Héron d'Amérique, D'ORB. *l. c.*
Héron cendré, LESSON, *l. c.*
Grand Héron bleu, LE MOINE, Ois. Canad. 1861, 330.*

HAB.—United States and Middle America; abundant from coast to coast. West Indies. South to the Galapagos (*Darwin*, *Hartl.*, *Scl. & Salv.*, *Salv.*); Panama (*Lawr.*); Rio Atrato, New Granada (*Cassin*); Venezuela (*Scl. & Salv.*). North to Nova Scotia (*Willis*); Hudson's Bay (*Brisson*); Saskatchewan (*Blakiston*); "Fur Countries", very rare (*Sw. & Rich.*); Sitka, rare (*Dall & Bannist.*); and Vancouver Island (*Brown*). Costa Rica (*von Frantzius*, *Lawr.*). Other localities quoted are, Guatemala (*Salv.*); Merida, Yucatan, and Isthmus of Tehuantepec (*Lawr.*); Tres Marias Islands (*Grayson*); Bahamas (*Bryant*, *Albrecht*); Bermudas (*Martens*); Cuba, breeds (*Gundl.*, *Caban.*, *Thienem.*); Jamaica, abundant (*Gosse*, *March*); Saint Croix (*Newton*, *Scl. & Salv.*); Saint Bartholomew (*Sundevall*); Sombrero (*Lawrence*).

Adult.—Length, about 42.00–50.00; extent, 72.00; weight, 5 to 8 pounds. Forehead and central feathers of the crown pure white; sides of crown and whole of the occiput, including the long plumes, blue-black. Chin, throat, and malar region pure white. Neck lavender-gray, fading gradually above into the white of cheeks and throat. Foreneck with a narrow medial series of black and ferruginous dashes mixed with white; lower neck-plumes pale lavender-gray. Lateral jugular tufts uniform blue-black; breast and abdomen black, this almost uniform laterally, but the middle feathers with broad medial stripes of white. Crissum white, the feathers sometimes edged with rufous. Tibial feathers deep chestnut-rufous, not growing conspicuously paler toward the body. Upper parts fine slate-blue, the dorsal and scapular plumes paler, more pearl-gray—the lightness of the tint proportionate to the length of the plume; remiges black, the inner secondaries growing gradually more slaty, so that the innermost are scarcely darker than the tertials. Tail deep slate-blue, a shade darker than the tertials. Entire border of the wing, from the armpit to the metacarpo-phalangeal joint, rich purplish-rufous, scarcely mixed anywhere with white, and much the widest at the bend.

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* The following citations have been referred to this species, but I think they had best be assigned to the "undeterminable" category:—

Ardea cristata maxima americana, CATESBY, Carolina, i. 1754, App. pl. 10.—SELIGM. Samml. 1749–76, tab. cviii. (Virginia).
Largest Crested Heron, CATESBY, *l. c.*
Le grand Héron hupé, CATESBY, *l. c.*

[This is either an entirely mythical species, or else the figure and description are drawn from recollection. The figure quoted above is absolutely unlike any known American bird, Heron or Crane, while the description, which says, "Length more than five feet; bill full eight inches long", cannot be made to apply to *Ardea herodias*. Although Linnæus quotes Catesby among his citations under *A. herodias*, his description, which is based on Edwards's *Ardea fusca canadensis*, is perfectly applicable to the adult of *A. herodias*. Various names have been based on Catesby's figure and description; but though it is obviously unnecessary to repeat them here, since I have them at hand they may as well be submitted:—]

Great Heron, LATH. Synop. iii. 1785, 85.—PENNANT, Arct. Zool. ii. 1785, 443, n. 341.
Le Héron huppé de Virginie, VIEILL. Nouv. Dict. xiv. 1817, 415.
Grand Héron d'Amérique, VIEILL. *l. c.*

Wing, 17.90–20.00; tail, 7.30–8.00; culmen, 4.30–6.25; depth of bill, through middle of nostril, 0.85–1.10; naked portion of tibia, 3.50–5.70; tarsus, 6.00–8.25; middle toe, 3.50–4.70. [Extremes of 17 adult specimens.] Bill olive above, the culmen blackish; lower mandible wax-yellow, brighter terminally (sometimes wholly yellow); iris bright yellow; bare loral space cobalt-blue in spring, olive-greenish or yellowish after breeding season. *Legs and feet dusky-black throughout.*

Young.—Above slate-gray (less bluish than in the adult), destitute of any penicillate plumes; anterior lesser wing-coverts bordered terminally with light rufous; border of the wing (broadly) white, more or less tinged with rufous, especially at and near the bend, where this color prevails. Entire pileum, including all the occipital feathers, blackish-slate, with a narrow median crest of more elongated darker-colored feathers, with pale fulvous shaft-streaks. Cheeks dark grayish; malar region, chin, and throat only, pure white. Neck dull gray, sometimes tinged with rufous, some of the feathers with indistinctly lighter shaft-streaks; foreneck with a narrow longitudinal series of black, rufous, and whitish dashes, much as in the adult. Breast and abdomen broadly striped with dark cinereous and white, in nearly equal amount (sometimes suffused with rufous). Tibiæ very pale rufous, sometimes almost white; crissum white. Upper mandible black, paler, or horn-color, along the tomium; lower, pale pea-green, deepening into clear horn yellow on terminal half; eyelids and horizontal space on lore light apple-green; iris gamboge-yellow; tibiæ and soles of toes, apple-green; rest of legs and feet black.[*]

Geographical and individual variations.—So far as is indicated by the rather scant material before me (17 adult specimens), there is little, if any, variation in proportions or colors which can be considered strictly geographical. Especially is this so with regard to dimensions and relative measurements of different parts in an individual,—a fact which is clearly shown by the annexed table of carefully-made measurements. The typical style, indeed, prevails with such uniformity that of the seventeen specimens now before me, only four differ in any noteworthy respect from the average style. These "aberrant" examples are the following:—

No. 68300, from Florida, is decidedly the largest in the whole series, its general size almost equalling that of *A. occidentalis*. The bill also approaches quite nearly to that of the latter species, both in size and form. In colors, however, it is true *herodias*, so far as essential characters are concerned, the head-pattern being exactly as in typical specimens of that species; the abdomen with black largely prevailing, etc. The only obvious difference from ordinary specimens of the species consists in the peculiar plumage of the neck, which at first sight appears to be white throughout. A close examination, however, reveals the fact that the feathers are very much worn or abraded, and that wherever they are least so a lavender-gray tinge is distinctly visible! Now, if we examine closely the neck-plumage of typical *A. herodias*, we find that it is only the *surface* which has this lavender-gray color, the concealed portion of the feathers being *whitish;* so that the white appearance of the neck in this specimen is thus readily accounted for. As probably indicating a tendency to albinism, it may be remarked that there are in this specimen many pure white feathers mixed through the rump and upper tail-coverts.

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[*] Notes taken from fresh specimen [No. 1050, Coll. R. R., ♀ *juv.*, Mount Carmel, 'nois, Sept. 26, 1870. Length, 42.00; expanse, 68.50].

The most important specimen of all, since its peculiarities are real, and not merely apparent, is No. 8065, from Mexico, also an adult. This example represents the opposite extreme in size from that just noticed, being much the smallest in the whole series. As to plumage, it is typical *A. herodias*. The shades of color are very deep and dark throughout, however, though not more so than 4524, from Cape Flattery, W. T., which almost exactly resembles it in this respect. The neck of this specimen is of precisely the same shade as that of *A. occidentalis* ("*würdemanni*"). The chief peculiarity of this specimen is that the bill is throughout of a clear bright yellow, whereas in true *herodias* only part of the lower mandible is of this color, the upper being mainly dusky. Should this latter character, taken together with the very small size, prove constant in Mexican adult specimens, they may rank as a geographical race, for which the term "*Ardea lessoni*" Bonap. would probably have to be employed.

The Cape Flattery specimen alluded to above agrees exactly with the Mexican specimen as to colors, but its proportions are very peculiar Thus, while the wing is above the average length and the tail up to the maximum, the bill is considerably below the average, being smallest of all except that of the Mexican specimen; the tibia and tarsus represent the minimum length, while the middle toe is shorter than that of any other in the entire series!

The only other specimen in the collection worth mentioning in this connection is No. 33134, Cape Saint Lucas. This specimen, also an adult, is remarkable simply on account of its *very light colors*. There is an unusual predominance of white on the breast and jugulum, and the colors generally (excepting, of course, the black) are two or three shades lighter than in the average. Its measurements, as may be seen by the table, come near the maximum. In these peculiarities, however, we see only the result of an extremely dry and hot climate, the bleaching effect of which is plainly visible in all the birds of brown or grayish plumage* in that region of continued droughts, which embraces, besides the peninsula of Lower California, the whole of the desert region of the Southwestern United States and Western Mexico.

Younger specimens (probably in the second year), of which No. 12670 is a fair example, have the forehead dusky-slate, there being only a few white feathers in the crown; the cheeks strongly tinged with buff. The specimen alluded to is equally dark with that from Cape Flattery, W. T., and that from Mexico.

Seasonal variations.—Although the plumage of this species is essentially the same throughout the year, there are certain differences depending on the season which are worthy of note. In the spring, or at the commencement of the breeding season, the bill, except on the culmen, is almost entirely yellow (generally a wax-yellow, brighter on the lower mandible); and the bare orbital space cobalt-blue, while from the occiput grow two long, slender, pendant, black plumes. After the young are hatched, these plumes are dropped, the bare skin around the eye has changed to a yellowish-green hue, and the upper mandible become almost wholly dusky blackish-olive, with only the tomia and lower mandible yellowish. Of some twenty specimens killed June 11, 1877, at the Little Cypress Swamp, of Knox Co., Indiana, none had the white occipital plumes, while the bill and orbits were colored as last stated above. These birds were all shot at their breeding grounds, where were about one hundred and fifty occupied nests, mostly containing full-grown young.† Dissection of numerous specimens proved that no appreciable difference exists between the sexes, except in the smaller average size of the females. A male killed at Washington, D. C., April 9, 1875, and consequently in perfect plumage, had the bill and soft parts colored as follows:—Bill dull wax-yellow, brighter on the lower mandible; bare orbital space cobalt-blue; iris bright chrome-yellow; legs black, the tibiæ inclining to brownish; soles of toes dull grayish naples-yellow. A female obtained in spring at Mount Carmel, Ill., was similarly colored.

Nine of the specimens alluded to above averaged about seven pounds in weight, the maximum being a little less than eight, and the minimum over six. Although busily engaged in feeding their very voracious young, they were in good condition.

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* In birds of black, red, or other brilliant colors, these tints are *intensified*, rather than diluted, in such climates!

† These nests were all on very large and tall "Sycamore" trees (*Platanus occidentalis*), mostly at a height of about 90 to 100 feet from the ground, many of them higher; none were accessible. The Herons had apparently chosen these trees in preference to the equally tall cypresses, oaks, gums, etc., on account of the protective color of the branches, whose pale drab or silver-gray aspect corresponded so perfectly in color with the prevailing hue of the birds that it was quite impossible to distinguish them from crooked upright branches when they sat perfectly quiet, as was usually the case. In fact, all those shot were killed either on the wing or just after alighting.

List of specimens examined.

Museum-number.	Sex and age.	Locality.	Date.	Wing.	Tail.	Culmen.	Depth of bi'l through nostril.	Bare portion of tibia.	Tarsus.	Middle toe.
4594	Ad.	Cape Flattery, Wash. Ter		19.50	8.00	4.80	0.95	3.50	6.00	3.50
8065	Ad.	Mexico		17.90	7.50	4.30	0.85	4.00	6.00	3.75
9472	♂ ad.	Sacramento Valley		19.00	7.30	5.50	1.00	4.30	7.15	4.25
12670	Ad.	Potomac River		18.80	......	5.50	1.00	3.50	6.50	3.90
15352	Ad.	Oregon		19.40	......	5.70	1.00	4.75	7.00	4.10
33134	♂ ad.	Cape Saint Lucas		19.90	7.75	5.80	1.00	4.50	7.00	4.25
39011	Ad.	Hilton Head, S. C		19.00	7.70	5.55	0.95	4.70	7.50	4.15
63300	Ad.	Florida		20.00	7.50	6.30	1.05	5.70	8.25	4.70
71161	♂ ad.	Knox County, Indiana		19.85	8.00	5.75	1.00	4.75	7.30	4.45
71162	♂ ad.	......do		18.50	7.80	6.00	0.95	4.25	6.85	4.35
71163	♂ ad.	......do		20.00	8.00	5.70	1.05	4.30	7.00	4.10
71164	♂ ad.	......do		19.00	7.80	5.70	1.05	4.20	7.00	4.50
71165	♂ ad.	......do		19.30	8.00	5.70	1.00	5.00	7.25	4.35
71166	♂ ad.	......do		19.50	8.00	5.60	1.05	4.65	7.50	4.25
71167	♂ ad.	......do		19.25	8.00	5.80	1.00	4.60	7.20	4.25
71168	♂ ad.	......do		......	......	5.60	1.00	......	......	......
71169	♀ ad.	......do		18.40	......	5.40	0.95	......	......	......
72836	Ad.	Kansas		19.50	7.80	6.25	1.10	4.70	8.00	4.25
72837	Ad.	Mount Carmel, Ill		18.50	8.00	5.50	0.95	3.50	6.75	4.20

NOTE.—The above measurements are only those of the *adult* specimens in the National Museum. Additional specimens in other collections have been examined in this connection.

ARDEA CINEREA.

The Common Heron of Europe.

Common Heron, WILLUGH. Orn. 1678, 277, pl. xlix.—RAY, Synop. Av. 1710, A. 1.—ALBIN, Nat. Hist. Birds, i. 1738, pl. lxvii.—LATH. Synop. iii. 1785, 83; Suppl. ii. 303, n. 14.—PENNANT, Arct. Zool. ii. 1785, 444, n. 343 (part: includes *A. herodias*); Brit. Zool. ii. 1812, 10, n. 173, pl. iii.—MONTAG. Orn. Dict. 1812, —.—SELBY, Brit. Orn. ii. 1833, 11.—YARRELL, Brit. Birds, ed. 2, ——, 508, fig.; ed. 3, ii. ——, 537, fig.

Le Héron, BRISS. Orn. v. 1760, 392, pl. xxxiv.—BUFF. Ois. vii. 1770–86, 396, pl. xix. Pl. Enl. pl. 787 (*juv.!*).

Le Héron hupé, BRISS. Orn. v. 1760, 396. pl. xxxv.—BUFF. Ois. vii, 1770–86, 342; Pl. Enl. pl. 755 (*adult!*).

Ardea cinerea, LINN. Fauna Suec. 1746, 59; S. N. i. 1766, 236.—BRÜNN. Orn. Bor. 1764, 156.—SCOPOLI, Ann. i. 1769, n. 117.—MÜLLER, Prod. Zool. Dan. 1776, 22.—FRISCH, Vög. Deutschl. 1739–63, 199.—FABR. Faun. Grœnl. 1780, 106 (Greenland!).—GMEL. S. N. iii. 1788, 627.—LATH. Ind. Orn. 1791, 691.—TEMM. Man. Orn. 1815, 362.—LEACH, Syst. Cat. Mamm. and Birds B. M. 1816, 33.—FLEMING, Brit. Anim. 1828, 95.—BREHM, Vög. Deutschl. 1731, 580.—NAUM. Vög. Deutschl. ix. 1838, 24, t. 220.—JENYNS, Man. Brit. Vert. An. 1835, 186.—EYTON, Cat. Brit. B. 1836, 36.—GOULD, Birds Eur. 1837, pl. 273.—BONAP. Comp. List, 1838, 47; Consp. ii. 1855, 111 (Europe; Asia; Africa).—KEYS. & BLASIUS, Wirb. Eur. 1840, 79.—SCHLEG. Rev. Crit. 1844, 96.—MACGILLIV. Man. N. H. Orn. ii. 1840, 128.—GRAY, Genera B. iii. 1841, 555; Cat. Brit. Birds, 1863, 145; Handlist, iii. 1871, 26, n. 10099 (Europe; Nubia; Abyssinia; India; China; S. Australia; New South Wales).—WOLLEY, Contr. Orn. 1850, 109 (Faroë I.).—IRBY, Ibis, iii. 1861, 244 (India).—REINHARDT, Ibis, 1861, 9 (Nenortalik, Greenland).—SWINH. *ib.* 343 (North China).—BOUCARD, Cat. Av. 1876, 49, n. 1368 (Europe; India; Australia).

Ardea major, LINN. S. N. i. 1766, 236 (quotes *Ardea cinerea major*, WILL. Orn. 203, t. 49; RAY, Av. 98.—*Ardea alia*, GESN. Av. 219, t. 220; ALDR. Orn. 3, 333.—*Ardea cris-*

tata, Briss. Av. 5, 396, t. 35; Alb. Av. i. 59, t. 67).—Scopoli, Ann. i. 1769. n. 117.—Kram. Elench. 1756, 346, n. 4.—Frisch, Zool. Deutschl. 1739–63, 199.—Gmel. S. N. ii. 1788, 627.

Ardea cineracea, Brehm, Vög. Deutschl. 1831, 580.

Ardea rhenana, Sander. Naturf. xiii. ——, 195.

Heron, Bewick, Brit. Birds, ii. 1804, 37, fig.

Hab.—Palæarctic Region in general, excepting extreme northern portions. Accidental in South Greenland (*Fabr. l. c.; Reinhardt, l. c.; Newton, l. c.*); India (*Auct.*); Australia (*Auct.*).

Adult.—Forehead and centre of pileum pure white; sides of crown and occipital plumes deep black; rest of head wholly white. Neck light cinereous, with a very faint lavender tinge, gradually fading into the white of the head; the front part with a narrow longitudinal series of black dashes on a white ground. Upper parts bluish-gray, the penicillate plumes of the back and scapulars much lighter or pale pearl-gray. Border of the wing pure white; antaxillar tufts deep blue-black. Sides and flanks uniform pale blue-gray. Medial lower parts white, heavily striped laterally with blue-black. Tibiæ and crissum pure white.

Wing, 18.50; tail, 8.00; culmen, 4.80; depth of bill through middle of nostril, 0.85; bare tibia, 3.25; tarsus, 6.25; middle toe, 3.80. [No. 57006; Europe.]

Juv.—Pileum deep ash-gray; occipital plumes black. Neck ash-gray, the front with a narrow longitudinal series of black and rufous dashes, mixed with white, the former predominating. Upper parts uniform slate-gray, destitute of penicillate plumes. Malar region, chin, and throat white. Antaxillar tufts white, tipped with a rusty tinge. Edge of the wing and entire lower parts wholly white, tinged with buff. [No. 57007; Europe.]

Remarks.—The above list of synonyms of this common European species is not so complete as might be; but since it claims a place in the American fauna solely on account of its accidental occurrence in Greenland, enough references are given to answer the present purpose. The descriptions are taken from European examples, the only ones in the National collection.

List of specimens examined.

57,006	United States.	Adult.	Europe.
57,007	United States.	Juv.	Europe.

Ardea cocoi.

The Great Cocoi Heron.

Cocoi, Marcgr. Hist. Bras. 1648, 209.—Willugh. Orn. 1678, 284, pl. li.—Pison, Bras. ——, 89.—Ray, Synop. Av. 1710, 100, n. 15.—Lath. Synop. iii. i. 1785, 98, n. 71.

Blue Heron, Albin, Nat. Hist. Birds, 1738, iii. t. 79 (*fide* Gmel.).

Ardea cærulescens, Albin, *t. c.* 32, t. 79 (*fide* Linn.).—Vieill. Nouv. Dict. xiv. 1817, 413 (based on *Héron plombé*, Azara).

Ardea cayennensis cristata, Briss. Orn. v. 1760, 400, n. 3.

Le Héron hupé du Cayenne, Briss. *l. c.*

Coco, Buff. Ois. vii. 1770–86, 379.

Ardea secunda, Tetr. Antill. ii. ——, 273, t. 246 (*fide* Linn.; Gmel.).

Ardea cocoi, Linn. S. N. i. 1766, 237.—Gmel. S. N. I. ii. 1788, 629.—Lath. Ind. Orn. 1791, 693.—Less. Traité, i. 1831, 576 (Cayenne; Guadeloupe).—Bonap. Consp. ii. 1850, 110 (Cayenne; Brazil; Paraguay; Patagonia).—Burm. Th. Bras. iii. 1856, 415; La Plata Reise, ii. ——, 508.—Scl. & Salv. P. Z. S. 1866, 199 (Upper and Lower Ucayali); iv. 1869, 634 (Conchitas, Buenos Ayres); 1873, 305 (Ucayali, Huallaga, and Pebas, E. Peru); 1866, 199; 1867, 979; Nom. Neotr. 1873, 125 (whole of South America).—Gray, Handlist, iii. 1871, 27, n. 10103 (Brazil).—Boucard, Catal. Avium, 1876, 49, n. 1372 (Brazil).—Allen, Bull. Essex, Inst. 1876, 82 (Santarem, Brazil).

Ardea fuscicollis, Vieill. Nouv. Dict. xiv. 1817, 410 (Paraguay; = *juv.!*).

Ardea soco, Vieill. *t. c.* 423 (*ex* Lath.).

?*Ardea major*, Frazer, P. Z. S. 1843, 116 (S. Chile).

Hab.—South America in general, from Patagonia to Cayenne. Not recorded from the Pacific slope north of Chile (?).

Adult.—Entire pileum, from bill to occiput, including the postocular region, as well as the long occipital plumes, deep blue-black; rest of the head and whole neck pure white, the foreneck with a narrow longitudinal series of blue-black dashes. Upper surface pearl-gray, gradually fading into white on the lower wing-coverts; penicillate tips of the dorsal and scapular plumes also white; remiges bluish-slate; rectrices pearl-gray. Breast and abdomen deep blue-black, with broad stripes of pure white medially; tibiæ, crissum, and edge of the wing pure white.

Wing, 18.50–19.50; tail, 8.25–8.50; culmen, 5.85–6.75; depth of bill, through middle of nostril, 1.10–1.20; bare portion of tibia, 4.00–5.00; tarsus, 7.20–8.00; middle toe, 4.50–4.80.

Young.—Entire pileum dull black; rest of head white; neck pale cinereous, the foreneck with a narrow longitudinal series of black dashes. Upper parts uniform dark cinereous, without any penicillate plumes; remiges slate-black (much darker than in the adult). Lower parts plain cinereous laterally, white medially, with narrow stripes of dusky. Tibiæ ashy-white; crissum pure white. [No. 73070; Paraguay.]

In the National collection is a specimen of this species from Patagonia, which differs in several very appreciable respects from the typical style, and probably represents a distinct race. It is much larger than any of the other specimens (exceeding in some of its measurements even the maximum of *A. occidentalis*), while there are several important peculiarities in the coloration. The forehead has a distinct white patch extending back in the middle portion for about 1.75 inches, and bordering each side of the crown in a gradually diminishing narrow line to above the middle of the eye. Of this white there is not even a trace in true *cocoi*. In the latter, the pearl-gray of the lesser wing-coverts gradually whitens toward the anterior edge of the wing; but in this specimen the ash is of a uniform shade, bounded *abruptly* by a white anterior border. There is likewise a much greater amount of white on the lower parts, this color very largely predominating, while black prevails in the typical form. Other differences, but of less importance, might also be mentioned.

Without more specimens, however, or without further information, I hesitate to give this form a new name. Bonaparte (Consp. ii. p. 110) quotes "*major?* Molina" among the synonyms of *A. cocoi*, and further remarks,—"Specimina brasiliensia *minora*. Specimina ex Montevideo *majora*." It is quite likely, although no mention is made of any differences in coloration, that Bonaparte had in view the race whose distinctive characters have just been given, and that some name may be found, perhaps Molina's "*major*", applicable to this larger, white-fronted, Southern race.*

List of specimens examined.

Catalogue number.	Museum.	Sex and age.	Locality.	Date.	Wing.	Tail.	Culmen.	Depth of bill.	Bare portion of tibia.	Tarsus.	Middle toe.
15,351	U. S	Ad.	Chile	....	19.10	.....	5.85	1.00	5.00	8.00	4.30
43,799	U. S	Ad.	Conchitas, Buenos Ayres	....	18.50	8.50	6.30	1.12	5.00	8.00	4.60
55,896	U. S	Ad.	....do	....	18.50	8.25	5.85	1.10	......	7.20	4.50
66,611	U. S	Ad.	Patagonia	....	19.50	8.50	6.75	1.20	4.00	8.00	4.50
73,070	U. S	Ju.	Paraguay	....	....	......	....	......	......	......	......

DESCRIPTION OF TWO NEW AMERICAN GENERA OF ARDEIDÆ.

Genus DICHROMANASSA, Ridgway.

< *Egretta*, BONAP. Comp. List, 1838, ——. (*Nec* Bonap. 1831.)
< *Herodias*, BONAP. Consp. ii. 1855, 125. (*Nec* Boie, 1822.)
< *Demiegretta*, BAIRD, Birds N. Am. 1858, 662. (*Nec* Blyth, 1846.)
< *Florida*, BOUCARD, Catal. Av. 1876, 50. (*Nec* Baird, 1858.)
< *Ardea*, AUCT. (*Nec* Linn. 1766.)
= *Dichromanassa*, RIDGW. MS. (Type *Ardea rufa* Bodd.)

GEN. CH.—Medium-sized Herons, of uniform white or plumbeous plumage, with (adult) or without (young) cinnamon-colored head and neck; the form slender, the toes very short and the legs very long; the adults with the entire head and neck (except throat and foreneck) covered with long, narrowly-lanceolate, compact-webbed feathers, which on the occiput form an ample crest, the feathers of which are very narrowly lanceolate and decurved.

Bill much longer than the middle toe (about two-thirds the tarsus), the upper and lower outlines almost precisely similar in contour, being nearly parallel along the middle portion, where slightly approximated; the terminal portion of both culmen and gonys gently and about equally curved. Mental apex extending to a little more than one-third the distance from the middle of the eye to the tip of the bill, or to about even with the anterior end of the nostril; malar apex about even with that of the frontal feathers. Toes very short, the middle one less than half the tarsus, the hallux less than half the middle toe; bare portion of tibia more than half as long as tarsus; scutellation of tarsus, etc., as in *Herodias*, *Garzetta*, and allied genera.

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* Frazer (*l. c.*) gives an *Ardea major* from Southern Chile, which is, no doubt, one of the races of this species; it may be well to mention, however, that the only Chilian specimen I have seen resembles Buenos Ayres and Paraguayan examples, and is, therefore, true *cocoi*.

Plumes of the adult consisting of a more or less lengthened train of fastigiate, stiff-shafted feathers, with long, loose, and straight plumules, and extending beyond the tail; in addition to this train, the scapulars and the feathers of the whole head and neck, except the throat and foreneck, are long and narrow, distinctly lanceolate, and acuminate, with compact webs, and on the occiput are developed into an ample decurved crest.

Affinities.—This genus is perhaps most nearly allied to *Demiegretta*, Blyth,[*] with which it agrees quite closely in the form of the bill, and also, to a considerable extent, in coloration. *Demiegretta*, however, is at once distinguished by its extremely short tarsus (much shorter than the bill, instead of nearly a third longer!), which is altogether more abbreviated than in any American genus of this group, in proportion to the other dimensions. The plumes also are entirely different, there being none on the neck, with the exception of the jugulum, while those of the back are slenderly lanceolate, with compact webs, almost exactly as in *Florida cærulea*. The very great difference in form between *Demiegretta* and the present genus may be more clearly shown by the statement that while the bill and wing, as well as the general bulk, are nearly the same in the two, *Demiegretta* has the tarsus about 2.75 instead of 5.80 inches long, the middle toe 2.10 instead of 2.80, and the bare portion of the tibia 1.20 instead of 3.50! It will thus be seen that the proportions are entirely different in the two forms. The bill of *Demiegretta* is also very much more obtuse than that of *Dichromanassa*.

Demiegretta novæ-hollandiæ (Lath.) is of more slender build than the type-species, and is scarcely strictly congeneric; but it is otherwise similar, especially in the character of the plumage. The bill is more slender, approaching in form that of *Hydranassa*, but still different; the legs are also more elongated, but are decidedly less so than in the genus under consideration.

Genus SYRIGMA, Ridgway.

< *Ardea*, AUCT. (*Nec* Linnæus.)
< *Buphus*, BONAP. Consp. ii. 1855, 127. (*Nec* Boie, 1826.)
< *Ardeola*, GRAY, Handlist, iii. 1871, 30. (*Nec* Boie, 1822.)—BOUCARD, Catal. Avium, 1876, 51.
= *Syrigma*, RIDGWAY, MS. (Type *Ardea sibilatrix* Temm.)

GEN. CH.—Medium-sized or rather small Herons, with a general resemblance to the Night Herons (*Nyctiardea*, *Nyctherodius*, and *Pilherodius*), but of more variegated colors and very different proportions. Bill rather small (a little longer than the head and slightly exceeding the middle toe), much compressed anteriorly, the lower outline nearly straight, the upper straight for the basal two-thirds, the terminal portion gently curved; basal half of the culmen forming a distinct keel, with nearly vertical sides, the nasal fossæ of unusual depth and length; upper tomium gently concave anteriorly. Mental apex a little less than half-way from the centre of the eye to the point of the bill, and about even with the anterior end of the nostril; malar apex a little posterior to the frontal one. Tarsus slender, about one-third longer than the middle toe, the front with regular transverse scutellæ. · Outer toe longer than the inner, and reaching almost to the terminal joint of the middle toe; hallux nearly half as long as the middle toe; bare portion of tibia a little shorter than the inner toe; claws small (except the hinder one), moderately curved, and acute. First and fourth primaries nearly equal and longest; outer three with their inner webs very faintly sinuated near their ends. Tail moderate, even, of twelve moderately hard, broad feathers. No dorsal, scapular, or jugular plumes, but feathers of the lower neck much developed, broad, round-ended, and rather loose-webbed. Nuchal feathers narrow, and forming a sort of loose mane; occiput with a crest of six or more narrow, rather stiff, and slightly recurved flat plumes, the two largest about as long as the tarsus, the rest successively graduated in length.

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[*] Type, *Ardea jugularis*, BLYTH, Notes on the Fauna of the Nicobar Islands, Journ. Asiatic Soc. Bengal, xv. 1846, 376, = *Herodias concolor*, BONAP. Consp. ii. 1855, 121, = *Ardea sacra*, GMEL. This Heron also is dichromatic, having a pure-white phase as in *Dichromanassa rufa*, the normal plumage being uniform dark plumbeous or slate.

Affinities.—The nearest ally of this genus is probably *Nyctherodius*, which agrees quite closely in the proportions of the feet, and, to a certain extent, in the character of the plumage, particularly the occipital crest. Even in these particulars, however, it is very distinct, while in other respects the two are exceedingly different. The bill is somewhat like that of *Nyctiardea*, but is very much smaller and more slender, and is otherwise different. Upon the whole, it is a very strongly-characterized genus, without a very near relative in America, and, so far as I have been able to discover, in any portion of the Old World.

SYNOPSIS OF THE AMERICAN SUBFAMILIES AND GENERA OF CICONIIDÆ.*

Synonymy.

< *Ardeidæ*, VIGORS, 1825, et AUCT. ANTIQ.
=(?) *Ciconiidæ*, SELYS, Fauna Belg. 1842.
> *Ciconiidæ*, BONAP. Consp. ii. 1855, 104 (excludes *Tantalus*).—GRAY, Handlist, iii. 1871, 34 (do.).—BOUCARD, Catal. Av. 1876, 52 (do.).

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[*] I have hesitated somewhat whether to employ, as the family-name for the Storks and their near relatives the Wood Ibises, the term *Ciconiidæ* or that of *Tantalidæ*; the latter has decided priority (1831 instead of 1842), but is objectionable on account of having been originally bestowed upon a non-typical group, while it has most often been employed in a wider sense, including, besides the Wood Ibises, the Ibises proper (*Ibididæ*). Its adoption in the present case would, therefore, lead to confusion. As to the term *Ciconiidæ*, there is far less objection: it has always been used specially for the true Storks, and, although not always including the Wood Ibises, has been employed in this wider and proper sense by many authors. I therefore conclude to retain the term *Ciconiidæ* as the family designation of the present group.

=*Ciconiidæ*, Scl. & Salv. Nom. Neotr. 1873 (includes *Tantalus*).

<*Ciconidæ*, Lillj. P. Z. S. 1866, 15, 17 (includes "*Ciconinæ*", "*Plataleinæ*" =*Plataleidæ*, and "*Tantalinæ*" =*Ibididæ* + *Tantalus*).

=*Pelargi*, Nitzsch, Pterylog. 1833, 130 (includes *Scopus*, *Ciconia*, *Anastomus* and *Tantalus*).

>*Ciconiinæ*, Sundev. Meth. Nat. Av. Disp. Tent. 1872, 123. [<*Pelargi*.]

Diagnosis.

Large, Crane-like birds, with the bill much longer than the head, thick through the base, and more or less elongate-conical; the nostrils subbasal, more or less superior, and bored into the bony substance of the bill, without overhanging or surrounding membrane; maxilla without any lateral groove (extending forward from the nostril). Legs covered with small, longitudinally-hexagonal scales; claws short, depressed, their ends broad and convex, resting upon horny, crescentic "shoes"; hallux with its base elevated decidedly above the base of the anterior toes.

The above characters are sufficient to define this family, which is more intimately related to the true Ibises (*Ibididæ*) and Spoonbills (*Plataleidæ*) than to the Herons. (See page 221.) There are two well-marked subfamilies, with the following characters:—

Ciconiinæ.—Bill elongate-conical, acute, compressed, the end not decurved. Nostrils rather lateral than superior. Toes very short, the middle one much less than half the tarsus (only a little more than one-third); lateral toes nearly equal; claws short, broad, nail-like.

Tantalinæ.—Bill elongated, subconical, subcylindrical, the end attenuated and decurved, with the tip rounded; nostrils decidedly superior; toes long, the middle one one-half or more the length of the tarsus; lateral toes unequal, the outer decidedly longer than the inner; claws moderately lengthened, rather narrow, claw-like.

Subfamily Ciconiinæ.—The Storks.

Synonymy.

=*Ciconiinæ*, Gray, 1840; Handlist, iii. 1871, 34.—Boucard, Cat. Av. 1876, 52.—Bonap. Consp. ii. 1855, 104.

<*Ciconiinæ*, Sundev. Meth. Nat. Av. Disp. Tent. 1872, 123 (includes also *Anastomus* and *Tantalus*).

=*Ciconinæ*, Lillj. P. Z. S. 1866, 17.

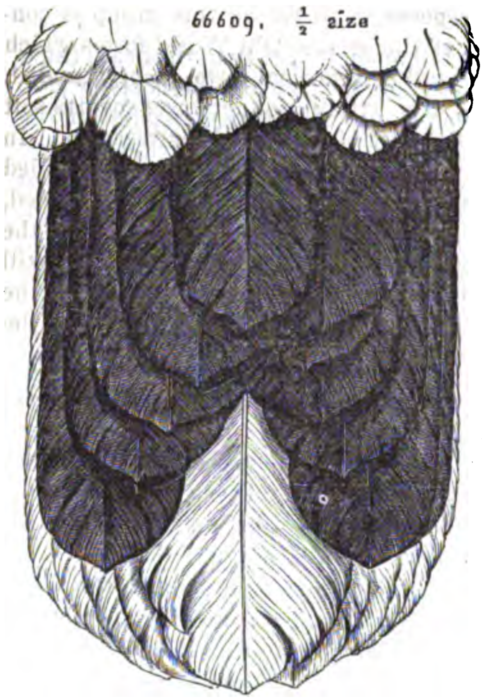
SYNOPSIS OF THE AMERICAN GENERA.

Euxenura.—Bill moderately large, its upper and lower outlines straight throughout; entire head and neck feathered, except the lores and a bare strip along each side of the throat. *Tail abbreviated and deeply forked*, the feathers very rigid, *the lower tail-coverts elongated* (extending beyond the true tail), *and stiffened, so as to resemble true rectrices!* (Type, *Ardea maguari* Gmel.=*Ciconia maguari* Auct.=*Mycteria americana*, Linn.!!!)

Mycteria.—Bill enormously large, the terminal half recurved. Entire head and neck naked, except a hairy, longitudinal patch on the occiput. Tail and tail-coverts normal. (Type, *Mycteria americana* Gmel. *nec* Linn.[*])

Genus EUXENURA, Ridgway.

< *Ciconia*, BRISSON, Orn. v. 369, n. 3.—BONAP. Consp. ii. 1855, 104, et AUCT.
< *Ardea*, GMEL. S. N. I. ii. 1788, 623.
= *Euxenura*, RIDGWAY, MS. (Type, *Ardea maguari*, Gmel.)



GEN. CH.—Large, Stork-like birds, with long, compressed, elongate-conical bill; long, densely-feathered necks; short toes and partly feathered heads as in *Ciconia*, but differing from that genus in the form of the tail, which is short and deeply forked, with very rigid feathers; the longer lower coverts similar to ordinary rectrices in form and development, having their upper surface convex, the shafts stiff, and the webs firm, thus presenting the appearance of a second tail!

Bill about equal to the tarsus, much compressed, its vertical outline elongate-conical, the terminal third of the culmen and gonys slightly convex; gonys shorter than the mandibular rami; nostrils almost linear, overhung by a sharp, projecting, horny edge, situated near the base of the maxilla, and nearer the culmen than the tomium. Middle toe about two-sevenths as long as the tarsus; outer toe reaching to the subterminal articulation of the middle toe; the inner toe a little shorter; hallux about half as long as the inner toe; bare portion of tibia about half the length of the tarsus and middle toe combined. Plumage compact above, loose beneath, particularly on the jugulum, where the feathers are longer, and with decomposed webs; entire lore and a wide suborbital space naked and somewhat papillose; chin and a wide strip on each side of the throat bare. Tertials extending to or slightly beyond the tips of the primaries; third or fourth quill longest.

Tail a little more than one-third the wing, deeply forked (the intermediæ a little more than half the length of the next to the outer pair, the lateral pair a little shorter than the next), the feathers broad and firm, with very rigid shafts; longer lower tail-coverts extraordinarily developed, resembling true rectrices, extending beyond the tail proper, and appearing as a second tail, of rounded form, below the upper forked one!

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[*] While giving a correct diagnosis of his genus *Mycteria*, with *M. americana* as type, Linnæus (S. N. i. 1766, 233) describes as the latter, in unmistakable terms, the birds afterward named *Ardea maguari* by Gmelin. The references given by Linnæus, however, refer mainly to the true *Mycteria!*

Affinities.—This genus is very similar to *Ciconia*, but differs very decidedly in the character of the tail and its lower coverts, which assume a form and relationship altogether peculiar, so far as this group is concerned, unless matched by some of the several Old World forms which I have not seen. In *Ciconia*, the tail is of normal form, being rounded, the feathers broad and moderately firm, with the longer lower coverts soft and loose, and falling considerably short of the end of the rectrices. In this genus, however, both the tail and its lower coverts are so modified that it is at first almost impossible to tell which is the true tail; indeed, all authors whom I have been able to consult in the matter describe the black stiff feathers as the upper coverts, and the longer, softer, but still firm feathers beneath them, with a rounded posterior outline, as the tail; in fact, it was only after the most careful examination, that I determined the former to be the true rectrices!

ART. X.—NOTICE OF THE BUTTERFLIES COLLECTED BY DR. EDWARD PALMER IN THE ARID REGIONS OF SOUTHERN UTAH AND NORTHERN ARIZONA DURING THE SUMMER OF 1877.

BY SAMUEL H. SCUDDER.

Although the collection of Dr. Palmer is not a large one, embracing only forty-one species, it adds considerably to our knowledge of the geographical distribution and variation of the species, and even contains several new forms; it seems worthy, therefore, of notice as a whole, and particularly since the special localities visited are off the ordinary route of travel.

The localities mentioned below are the following:*—

Beaver Mountains, Utah; the mountains about Beaver, Utah.

Paragoonah, Utah; 25 miles west of south of Beaver.

Bear Valley, Utah; a valley about 20 miles nearly south of Beaver, surrounded by spurs of the Wahsatch Mountains.

Pine Mountains, Utah; "20 miles north of St. George, Utah."

Mountain Meadows, Utah; the scene of the noted emigrant massacre, about 30 miles north of St. George. It is an elevated, meadow-like spot, surrounded by mountains.

St. George, Utah; at the extreme southern limit of the Territory.

Mount Trumbull, Utah; "60 miles east of St. George"; a slight elevation, in a rough, volcanic, mountainous region. The specimens were collected about a spring at the base.

Beaver Dam, Arizona; 25 miles west of south of St. George, on Virgin River. The most desert-like region visited. Dr. Palmer remarks that in the arid sections of Southern Utah and Northern Arizona, where plants appear only at widely separated localities, the butterflies fly much more swiftly than usual, and are very shy. The easiest place of capture is in the vicinity of springs or pools of rain-water.

Mokiak Pass, Arizona; "20 miles east of south of St. George"; a pass in mountains between St. George and Juniper Mountains, in a very broken and rough volcanic region.

Juniper Mountains (or Cedar Ridges), Arizona; a region much like the previous, "40 to 50 miles east of south of St. George", covered with juniper-trees and scrub-pines. It is about 20 miles east of south of Mokiak Pass.

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* Most of these localities may best be found in the Atlas of Wheeler's Survey for 1874; but Pine Mountains, Mount Trumbull, Mokiak Pass, and Juniper Mountains do not appear. In these latter cases, I have mentioned the distances given me by Dr. Palmer; although in the other cases the distances he gave me invariably proved too great.

Neominois dionysus, nov. sp.—Differs from *N. ridingsii*, to which it is closely allied, by its larger size, its more cinereous tints, and by the much more produced serrations of the margins of all the banded markings of the hind wings. In most specimens, this latter feature is much more conspicuous below than above, and is generally more noticeable than elsewhere in the interspace beyond the cell, the tooth of the black line which crosses the middle of the wing sometimes extending one-third the distance to the margin of the wing. Where specimens of the two species approach each other in the sharpness and length of the serrations, this species can always be distinguished by its larger size, lighter tone, and the lesser contrast of its darker and paler markings. The lower median interspace of the hind wings bears a small, oval, longitudinal spot on the upper surface next the outer limit of the broad, submarginal, pale band, smaller and even obsolete in the male. The same spot occasionally appears, but less conspicuously, in the female of *N. ridingsii*. Although Nevada specimens of the latter appear to be larger than those from Colorado (*cf.* Edwards's description of *Sat. stretchii*), in so far approaching this species, *Satyrus stretchii* appears to be a true synonym of *N. ridingsii*, being in other respects no closer to the species here separated.

Expanse of wings: ♂, 48–51^{mm}; ♀ 55–58.5^{mm}; 7 ♂, 4 ♀. Juniper Mountains, June 4; Mount Trumbull, June 7–10.

Cœnonympha ochracea Edw.—Bear Valley, July 4; Paragoonah, July 10–12.

Anosia berenice (Cram.) Scudd.—St. George, April–May.

Basilarchia weidemeyeri (Edw.) Grote.—Bear Valley, July 4; Beaver Mountains, July 18–20.

Papilio antiopa Linn.—St. George, April–May; Mokiak Pass, April 28–30.

Vanessa cardui (Linn.) Ochs.—Paragoonah, July 10–12.

Argynnis nevadensis Edw.—Beaver Mountains, July 18–20.

Argynnis rupestris Behr.—Beaver Mountains, July 18–20. This butterfly does not appear to have been recorded before from without the limits of California.

Argynnis coronis Behr.—A single female was taken by Dr. Palmer on the Beaver Mountains, July 18–20, which differs from specimens sent me by Mr. W. H. Edwards, under this name, in the darker color of the upper surface of the wings, the brown becoming nearly black and the fulvous deepening to tawny, and in its smaller size, since it only expands 50^{mm}. Beneath, the markings are precisely the same, excepting that the extra-mesial row of silver spots on the hind wings is distinctly followed apically by a row of small, bordering, olivaceous spots; the tints are all a little darker; the submarginal band of the hind wings has become of a saffron hue, and the inner margin of the same wings is broadly sprinkled with green, a tint which appears more or less in other parts, and especially on the costal margin of the hind wings and the outer margin of the front wings. Notwithstanding these differences, and the fact that *A. coronis* has not before been detected out of California, there seems to be no doubt that the specimen should be referred as above.

Lemonias anicia (Doubl.-Hew.) Scudd., var. *editha*.—Mokiak Pass, April 28–30 or June 2; Pine Mountains, May 12; Paragoonah, July 10–12; Beaver Mountains, July 18–20.

Lemonias helcita (Boisd.) Scudd.—Five specimens (4 ♂, 1 ♀) were taken at Mokiak Pass, April 28–30 (or June 2), and Pine Mountains, May 12, and are the first perfect specimens I have been able to study. It seems to be abundantly distinct from *L. palla*, of which Mr. W. H. Edwards considers it only a variety. All the specimens agree very closely, and differ from *L. palla* on the upper surface of the wings in the decidedly paler and duller ground-color; the middle of the outer half of both wings is crossed in *L. palla* by a pair of almost exactly similar and distinct, parallel, black bands; the outer only is distinct in *L. helcita* (and is much narrower than in *L. palla*,) the inner being much fainter and almost or quite obsolete in the middle of its course; the pale mesial band of the hind wings of *L. palla* is scarcely paler than the other parts of the wing in *L. helcita*. Beneath, similar differences occur; the fulvous tints are decidedly paler in *L. helcita*, as above, while the straw-yellow which marks the lunules and other pale spots in *L. palla* is replaced by nacreous-white; besides, the hind wings further differ in the much greater extent of the pale markings, which are not so compactly massed as in *L. palla;* the outer of the two cell-spots especially is much larger than in *L. palla*, while the cinnamon band of *L. palla*, embraced between the mesial band and the submarginal lunules, is reduced to a narrow series of four or five dull red, round spots, indistinctly margined with pale scales; the outer reddish margin of *L. helcita* is not more than half so broad as the deeper-colored border of *L. palla*. The species has not before been recorded from either Utah or Arizona.

Schoenis arachne (Edw.) Scudd.—Bear Valley, July 4. These are the first specimens of this species I recollect seeing. Although both Edwards and Mead place it as a synonym of Edwards's earlier-published *Mell. minuta*, there appear to me to be such differences between the descriptions and figures of the two that it would be well to retain them as distinct until direct comparison of a series of specimens from Texas and Arizona can be made.

Phyciodes pratensis (Behr.) Kirb., var. *campestris*.—Pine Mountains, May 12; Mount Trumbull, June 7–10; Bear Valley, July 4; Paragoonah, July 10–12.

Incisalia augustus (Kirb.) Min., var. *irioides*.—A single male was taken at Mount Trumbull, June 7–10. It is a good deal rubbed, but is sufficiently well preserved to show that it differs from California specimens in having the apical half of the wings beneath very nearly of the same dark slate-color as the upper surface, being almost wholly destitute of any ruddy tint. It has never before been taken in this region.

Uranotes melinus (Hübn.) Scudd.—St. George, April or May.

Thecla siva Edw.—Juniper Mountains, May 1–2 or June 4; Paragoonah, July 10–12.

Everes amyntula (Boisd.) Scudd.—Paragoonah, July 10–12.

Cupido pheres (Boisd.) Kirb.—The specimens collected by Dr. Palmer (8♂, 4♀) are the first recorded from this region, and are more uniform in appearance than appears to be common; they also differ in certain respects from California specimens, The upper surface of the male, for instance, is of a deeper violet and the dusky margin is narrower upon the front wing; in the female, the colors of the upper surface are more contrasted; and beneath, in both sexes, the extra-mesial row of spots on the front wings are almost uniformly well defined, moderately large, rounded, and somewhat regularly curved; while the same series on the hind wings are white, generally with a central, subobsolete, black dot, although in this respect the females vary considerably. Mountain Meadows, May 14–18; Mount Trumbull, June 7–10; Beaver Mountains, July 18–20.

Cupido sæpiolus (Boisd.) Kirb.—The single male obtained at Bear Valley, July 4, is of an unusually small size (expanse of wings, 30^{mm}), with heavy markings beneath, as usual in California specimens.

Cupido heteronea (Boisd.) Kirb.—Beaver Mountains, July 18–20.

Rusticus battoides (Behr) Scudd.—Juniper Mountains, May 1–2 or June 4. Never before found in this section.

Rusticus melissa (Edw.) Scudd.—Bear Valley, July 4; Beaver Mountains, July 18–20.

Brephidium exile (Boisd.) Scudd.—St. George, April–May; Beaver Dam, April 20–28; Juniper Mountains, May 1–2.

Chalceria sirius (Edw.) Scudd.—Two males taken on the Beaver Mountains, July 18–20, are too rubbed to determine positively whether they belong to this species or to *C. rubida*, although they appear more to resemble the former.

Epidemia helloides (Boisd.) Scudd.—Juniper Mountains, May 1–2 or June 4; Bear Valley, July 4; Paragoonah, July 10–12.

Eurymus eurytheme Boisd. sp.—St. George, April–May; Juniper Mountains, May 1–2 or June 4; Beaver Mountains, July 18–20.

Nathalis iole Boisd.—Juniper Mountains, June 4; Mount Trumbull, June 7–10; Beaver Mountains, July 18–20.

Synchloe thoosa, nov. sp.—Allied to *S. cethura* (*Anth. cethura* Feld.), but differing from it in many details. On the upper surface of the front wings, the orange spot is deeper in tint and narrower, partly because of the greater breadth of the transverse costal bar at the tip of the cell. Beyond the orange patch, the wing is dark brown, the border continuing over the whole outer margin, although narrowing rapidly below; within this broad, brown border are longitudinal, white dashes, slightly largest inwardly, extending to the margin only on the lower half of the wing, where, in the interspaces, the brown fringe is interrupted with white. The disk of the hind wing is suffused with citron, and next the tip of all the nervules is a faint sprinkling of black dots, more noticeable on the outer than the inner half of the wing. Beneath, the orange spot of the front wings is nearly as conspicuous as above, and the space occupied above by the brown border is heavily sprinkled with grayish, slightly greenish-brown scales, largely interrupted in the interspaces with long white wedges pushing inward from the margin. On the hind wings, the greenish-yellow of *S. cethura* is replaced by the same grayish-brown found at the apex of the front wings, and is arranged in a pattern closely resembling that of *S. cethura*, but with noticeably narrower white spaces. Expanse, 35 millimetres.

A single female was taken at Mokiak Pass, April 28–30 or June 2.

Pieris oleracea (Harr.) Boisd.—To this species I refer for the present a single small, immaculate butterfly taken on the Beaver Mountains, July 18–20, reserving some remarks upon it for a future paper.

Pontia protodice Boisd. sp.—St. George, April–May; Juniper Mountains, May 1–2 or June 4; Bear Valley, July 4; Paragoonah, July 10–12.

Jasoniades daunus Boisd. sp.—Juniper Mountains, June 4; Paragoonah, July 10–12.

Epargyreus tityrus (Fabr.) Scudd.—Mount Trumbull, June 7–10.

Thorybes pylades Scudd.—Mount Trumbull, June 7–10; Beaver Mountains, July 18–20.

Thanaos propertius Scudd.-Burg. sp.—This species has been hitherto known from California only. It was taken by Dr. Palmer at Mokiak Pass, April 28–30; Juniper Mountains, May 1–2; and Mountain Meadows, May 14–18.

Thanaos, nov. sp.—The description of this species will be given with others at a future time. Only a single female was taken (Mount Trumbull, June 7–10); but I have before received the same form from the same general region.

Hesperia comus Edw.—Juniper Mountains, June 4; Mount Trumbull, June 7–10.

Hesperia tessellata Scudd.—St. George, April–May; Mokiak Pass, April 28–30 or June 2; Mount Trumbull, June 7–10; Bear Valley, July 4; Beaver Mountains, July 18–20.

Heliopetes ericetorum (Boisd.) Scudd.—Mokiak Pass, April 28–30 or June 2; Mount Trumbull, June 7–10.

Pholisora catullus (Fabr.) Scudd.—St. George, April–May; Pine Mountains, May 12.

Heteropterus libya, nov. sp.—This species is placed provisionally in the genus *Heteropterus*, of which *Pap. morpheus* Pall. is the type, but differs from it to such an extent that it must undoubtedly be eventually separated therefrom.

The wings are uniform dark glossy brown above, with a tinge of dark green; the fringe concolorous, excepting on the upper half or more of the fore wings, where it is albescent. Midway between the tip of the fore wing and the apex of the cell is a conspicuous, though not large, slightly oblique, white cross-band, interrupted by the nervules occupying the three lower subcostal interspaces, while there is an inconspicuous white spot in the centre of the middle median interspace. Beneath, the front wings are paler than above, with the markings repeated, sometimes (in male only ?) with less distinctness, and with a hoary clouding at the apex of the wing. Hind wings of the same ground-color, but with such a sprinkling of olivaceous scales as to give a decided greenish hue; the inner margin as far as the submedian vein almost entirely or quite white; a transverse band of squarish, snow-white spots of median size cross the wing, represented particularly by equal spots in the subcosto-median and medio-submedian interspaces; midway between the former and the base is a smaller, circular, snow-white spot, and occasionally a few white scales midway between them in the costo-subcostal interspace, which may properly be considered part of the median series; in addition, there is a series of submarginal, vaguely defined, roundish or lunular white spots in the interspaces.

The palpi are white beneath, dark brown above; and this, together with the shape of the wings, gives it a certain resemblence to *Pholisora catullus*. Antennæ white beneath, dark brown above, narrowly annulated with white at the base of the joints of the stalk; the club purplish-black. Expanse of wings, 32^{mm}; length of antennæ, 7^{mm}.

1♂, 2♀. Beaver Dam, April 20–28.

Ochlodes sonora Scudd.—Beaver Mountains, July 18–20. This species has not been hitherto reported east of the Sierra Nevada. By what we presume must be a clerical error, Mr. W. H. Edwards, in his recent catalogue, places this as a synonym to Boisduval's *Hesp. sylvanoides*.

ART. XI.—NOTES ON THE HERPETOLOGY OF DAKOTA AND MONTANA.

BY DRS. ELLIOTT COUES AND H. C. YARROW.

The present article is based primarily upon a collection of Reptiles and Batrachians made in Dakota and Montana in 1873–74 by Dr. Coues, as Naturalist of the United States Northern Boundary Commission.

In identifying these specimens, the authors have diligently compared them with other material from the same geographical area in the National Museum, and have added to the species collected by Dr. Coues others known to occur in the region under consideration, thus presenting a tolerably complete list of the Reptiles and Batrachians of the two Territories. No species is introduced that is not fully identified and determined to inhabit this portion of the United States. Care has been taken with the synonymy to exclude doubtful references, except in one or two instances. The descriptions are drawn directly from the specimens, and considerable matter of popular interest has been introduced. The nomenclature and classification are mainly according to Professor Cope's recent Check List, though the authors have not hesitated to differ from this authority on occasion.

A.—REPTILIA.

CHELONIA.

Family EMYDIDÆ.

Genus CHRYSEMYS. *Gray.*

CHRYSEMYS OREGONENSIS. (*Harlan*) *Ag.*

Oregon Golden Turtle.

Emys oregonensis, HARL. Am. Journ. Sci. xxxi. 382, pl. 31.—HOLBR. N. Am. Herpet. i. ——, 167, pl. 16.—DEKAY, N. Y. Fn. iii. 1842, 20.

Chrysemys oregonensis, AG. Contr. Nat. Hist. U. S. i. 1857, 440, pl. 3, f. 1–3.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 4 (Texas).—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 68 (Fort Rice, Dakota).

Specimen.

1096. Mouse River, Dakota. Aug. 30, 1873.

Shield Reptiles are not well represented in the region surveyed by the commission, where the present, the only one observed, appears to be the most characteristic species. Professor Agassiz notices specimens from different localities in Minnesota and from the Yellowstone, where it was also observed by the Prince Maximilian and Mr. J. A. Allen. The former naturalist expresses great doubts respecting the accuracy of Nuttall's statement that it is found in Oregon, as it has never been seen in that Territory by any of the recent explorers, the only true Turtle of the Pacific slopes being the *Chelopus marmoratus* Bd. & Grd. (*Emys nigra* of Hallowell). It is, however, a species of wide distribution in the central region, having been observed southward nearly to the Mexican border in Texas.

The following additional species of this order are indicated by authors as occurring on or near the northern boundary:—

Genus PSEUDEMYS. *Gray.*

PSEUDEMYS ELEGANS. (*Maxim.*)

Elegant Terrapin.

Emys elegans, MAXIM. Reise Nord-Amer. i. 1839, 213 (Upper Missouri).—HAYD. Trans. Am. Phil. Soc. xii. 1862, 177 (Yellowstone).
Trachemys elegans, AGASS. Contrib. Nat. Hist. U. S. i. 1857, 435.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 3 (Texas.)
Pseudemys elegans, GRAY.—COPE, Check List Bat. Rept. N. A. 1875, 53.
Emys cumberlandensis, HOLBR. N. Am. Herpet. i. 115, pl. 118 (Tennessee).—DEKAY, N. Y. Fauna, iii. 1842, 20.
Emys holbrookii, GRAY, Cat. Brit. Mus. 1844, 23.
Emys terrapin, WAILES, Geol. Rep. Mississippi, 1854, p. — (*fide* Agass.).

A species originally described from the Upper Missouri by Prinz Maximilian von Neu Wied, and subsequently ascertained to occur throughout the Central region, east to the Ohio, and south to Texas.

Genus CISTUDO. *Fleming.*

CISTUDO ORNATA. *Agass.*

Ornate Box-turtle.

Cistudo ornata, AGASSIZ, Contrib. Nat. Hist. U. S. i. 1857, 445, pl. 3, f. 12, 13.—COPE, Check List Bat. and Rep. N. A. 1875, 53.

The Northwestern type of *Cistudo*, Professor Agassiz remarked, in proposing *C. ornata*, is of all the forms the most likely to be distinct, and such has proven to be the case. "It is round, broad, and flat, without keel, even when young, while the young of *Cistudo virginea* are always strongly keeled." The species is based upon specimens from the Upper Missouri and from Iowa.

Family TRIONYCHIDÆ.

Genus ASPIDONECTES. *Wagler.*

ASPIDONECTES SPINIFER. (*Les.*) *Ag.*

Trionyx spiniferus, LE SUEUR, Mém. Mus. d'Hist. Nat. xv. 258, pl. 6.
Aspidonectes spinifer, AGASS. Contrib. Nat. Hist. U. S. i. 1857, 403.—COPE, Check List N. A. Bat. and Rep. 1875, 51.
Trionyx ocellatus, LE SUEUR (young ♀, *fide* Agass.; not of DeKay, which is *Amyda mutica*).
Trionyx ferox, *partim*, ALIQ.

The Northern and Northwestern *Aspidonectes*, the characters and synonymy of which were first satisfactorily distinguished from those of the Southern *A. ferox* by Professor Agassiz in the work above cited, is represented as a common species from New York and Pennsylvania to the Rocky Mountains, where it is mentioned as occurring by Lewis and Clarke. According to Say and Allen, it is frequently found in the tributaries of the Missouri; the last-named naturalist took it in the Musselshell and Yellowstone. (*See* ALLEN, Proc. Bost. Soc. Nat. Hist. 1874, p. 69.)

Family CHELYDRIDÆ.

Genus CHELYDRA. *Schw.*

CHELYDRA SERPENTINA. (*L.*) *Harl.*

Snapping Turtle.

Testudo serpentina, LINN. Syst. Nat. ed. 12, i. 1766, 354 (localities erroneously assigned as Algiers and China). Also of other older authors.—LEC. Ann. Lyc. Nat. Hist. N. Y. iii. 127.
Chelonura serpentina, SAY, Journ. Acad. Nat. Sci. Phila. iv. 217.—HOLBR. N. Am. Herpet. 1st ed. iv. 21, pl. 3; 2d ed. i. 139, pl. 23.—DEKAY, N. Y. Fn. iii. 1842, 8, pl. 3, f. 6.
Emys serpentina, GRAY, Syn. Rept. in Griffith's An. Kingd. ix. 14.
Chelydra serpentina, HARL. Med. & Phys. Res. 1835, 157.—AGASS. Contrib. Nat. Hist. U. S. i. 1857, 417. And of most late authors.—COPE, Check List N. A. Bat. and Rep. 1875, 51.
Emysaurus serpentina, DUMÉR. & BIBR. Erp. Gén. ii. 350.—STORER, Rep. Mass. ——, 212.
Chelydra emarginata, AGASS. *op. cit.* in text.
"*Chelydra lacertina*, SCHW." (young).
"*Testudo serrata*, PENN."
"*Testudo longicauda*, SHAW."

A species of remarkably extended distribution, from the Northern border of the United States to South America; not, however, in the Pacific region.

OPHIDIA.

Family CROTALIDÆ.

Genus CROTALUS. *Linn.*

CROTALUS CONFLUENTUS. *Say.*

Missouri Rattlesnake.

Crotalus confluentus, SAY, Long's Exped. R. Mts. ii. 1823, 48.—BD. & GIR. Cat. N. Am. Reptiles, 1853, 8.—BD. Pac. R. R. Rep. x. 1859, Reptiles of Whipple's Route, 40; pl. 24, f. 4.—BD. U. S. and Mex. B. Surv. ii. pt. ii. Reptiles, 14.—COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 295, pl. 12.—COPE, Check List N. A. Bat. and Rep. 1875, 33.

Caudisona confluenta, COPE, App. Mitchell's Researches, 1861, 122.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 307, 309.—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 69.

Crotalus lecontei, HALLOW. Proc. Acad. Nat. Sci. Phila. vi. 1851, 180.—HALLOW. Sitgreaves's Rep. Expl. Zuñi and Colorado, 1853, 139, 147, pl. 18.—HALLOW. Pac. R. R. Rep. x. 1859, Williamson's Route, Reptiles, 18, pl. 3.

Caudisona lecontei, COPE, App. Mitchell's Researches, 1861, 121.—HAYD. Trans. Am. Phila. Soc. xii. 1862, 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 307.

Crotalus cinereus, LECONTE *apud* HALLOW. Sitgreaves's Rep. Expl. Zuñi and Colorado, 1853, 140 (in text).

Specimens.

1149.	Sweet Grass Hills, Montana.	July 29, 1874.
1150.	Sweet Grass Hills, Montana.	July 29, 1874.
1197.	Black Coulé, near Teton River, Montana.	Sept. 6, 1874.
1198.	Black Coulé, near Teton River, Montana.	Sept. 6, 1874.
1199.	Black Coulé, near Teton River, Montana.	Sept. 6, 1874.

The ascribed characters of *C. lecontei*, as compared with *C. confluentus*, are found not to hold good when sufficient series are examined. The number of superior labials in our specimens, and in others from the Yellowstone, ranges from thirteen to sixteen, while in others eighteen are described. Certain ascribed features of coloration are altogether uncertain, as specimens vary interminably in the distinctness of the dorsal blotches and in the details of the light markings about the head. This appears to be due in part to age, as the smaller specimens are usually the most boldly blotched, while on some of the largest examined the markings are nearly obsolete. These statements are fully borne out by our experience, we having noticed in this particular species that the blotching cannot be relied upon as a distinctive character, as in some individuals, notably from localities where the color of the soil is light, the blotches in some instances are barely perceptible; moreover, the forms of the blotches vary indefinitely, as some are serrated on their borders, others present an unbroken line. The distinctness of the pattern of coloration also depends somewhat upon season, the markings being clearest just after the shedding of the skin. There is certainly no specific difference between the two supposed species, and varietal distinction can hardly be predicated, at least upon the characters as yet adduced. In any event, the specimens above enumerated are the true *C. confluentus* of Say. Two of these are of unusual size, being both over four feet in length, a dimension near the known maximum of this species, though less than that of some others. The average length is less than three feet, and the calibre of the body, even in the largest examples, is relatively inferior to that of several Southern species.

The number of rattles in this and other species, though of course increasing with age, is not an infallible clue to the age of a specimen; for, accidental variation aside, it is far from proven that an annual increase by one is regular. On the contrary, the growth of the organ must depend largely, as in all parallel cases, upon the vigor of the individual, which is not the same at all periods of life, granting even a continuous state of perfect health. The purpose subserved in the economy of the animal by this singular organ has been the subject of much speculation and discussion. It is difficult to perceive of what use the rattle can be, either in procuring prey or avoiding enemies. We do not know that it comes into play at all in the pursuit of prey, while the actual result of its use as a menace in self-defence is the reverse of beneficial to the serpent, since the sound serves to direct and provoke attack from all enemies which the animal has occasion to fear. The theory that the rattle is a part of the serpent's means of terrifying its intended victim, used as an adjunct of other supposed powers of fascination, may be safely held in check until it is proven that this peculiar influence is ever exerted to the extent of preventing its prey from seeking safety in flight. The notion that the rattle is intended to serve as a warning, and thus offset the venomous nature and highly dangerous powers of the serpent, is contrary to all analogy, since animals are endowed with attributes for their own good, irrespective of the result upon others, and would require a faith in the intervention, for the benefit of the dominant species of the *Mammalia*, of special Providences, a belief now held by few thoughtful persons. It has been suggested that the rattle may be used to call the sexes together, and thus serve a useful purpose in the perpetuation of the species,—a hypothsis less untenable than some of the others which have been advanced. Another supposition, made irrespective of "final causes", is, that the rattle has resulted, in the course of time, from the continual agitation of the caudal extremity of these highly nervous and irritable creatures, and that it has no special function. This seems not unreasonable, although, in view particularly of the fact that rattlesnakes alone, of the many equally or more venomous reptiles, have such appendage, it is not entirely satisfactory. One thoroughly established fact concerning the rattle is that its practical operation is injurious to its possessor by provoking attack from those who can cope with it successfully. It may be suggested, that inasmuch as to an unpracticed ear the rattle of the *Crotalus* cannot be distinguished from the crepitation of the large Western grasshopper, it may serve the purpose of attracting within reach of the fangs of the snake the many birds who greedily devour these insects. The rattle has been heard at times when no apparent cause of irritation to the snake existed, and a case has been reported in which a biped was drawn within reach of a rattler, thinking it a grasshopper.

The principal enemies of the rattlesnake, besides man, are wild hogs, peccaries, and deer. The latter kill the serpent when coiled by striking with the hoofs; the former attack it successfully with hoofs and teeth, and in some regions derive no small part of their subsistence from this source. The popular belief that the venom of the rattlesnake is innocuous to hogs is merely a partial statement of the fact that the fluid usually fails to enter the circulation through the layer of adipose tissue with which these animals are commonly covered. The venom is conceded to be innocuous when introduced to the stomach, and the flesh of the rattlesnake is as edible as that of other serpents. The fatality of the rattlesnake's bite is by no means the constant element generally supposed, but the result may vary from the slightest amount of poisoning to one rapidly fatal. This depends altogether upon the amount of venom absorbed in the system, and the rapidity of its diffusion through the circulation, matters which turn upon the amount of venom in store at the moment of striking, the vigor of the animal at the time, the penetration of the tooth, the part of the body struck, and, finally, the state of health of the person attacked. No positive specific antidote is known. Surgical means of preventing dispersion of the poison through the system, and alcoholic stimulation to the highest pitch, are the usual resorts.

It may not be out of place to refer in this connection to the interesting mechanism of the poison apparatus, as it is a matter not very generally known as yet, though clearly set forth by the researches of specialists, notably Dr. S. Weir Mitchell. The venomous fluid to be injected into a wound made by the teeth has nothing to do with the ordinary saliva, as popularly supposed; nor does the forked tongue or any of the numerous small teeth of the mouth take part in the infliction of the wound. The tongue and smaller teeth are essentially the same as in any harmless serpent. The active instruments are a pair of fangs,* one on each side of the upper jaw, rooted in the maxillary bones, which bear no other teeth. The fangs vary in size, being sometimes half an inch long. They are somewhat conical and scythe-shaped, with an extremely fine point; the convexity looks forward, the point downward and backward. The fang is hollow, for transmission of the venom; but the construction of the tube is not as if a hole had been bored through a solid tooth. It is in effect a flat tooth, with the edges rolled over together till they meet, converting an exterior surface, first into a groove, finally into a tube. This is shown, on microscopic examination of a section of the tooth, by the arrangement of the dentine. Unlike an ordinary tooth, the fang is movable, and was formerly supposed to be hinged in its socket, since it is susceptible of erection and depression. But the tooth is firmly socketed, and the source of this movement is the maxillary bone itself, which rocks to and fro by a singular contrivance. The maxillary is a small, stout, triangular bone, movably articulated above with a smaller one, the lachrymal, which is itself hinged upon the frontal. Behind, the maxillary articulates with the palatal and pterygoid, both of which are of rod-like shape, and are acted upon by the spheno-pterygoid muscle, the contraction of which pushes them forward. This forward impulse of the palatal and pterygoid is communicated to the maxillary, against which they abut, causing the latter to rotate upon the lachrymal. In this rocking forward of the maxillary, the socket of the fang, and with it the tooth itself, rotates in such manner that the apex of the tooth describes the arc of a circle, and finally points downward instead of backward. This protrusion of the fang is not an automatic motion, consequent upon mere opening of the mouth, as formerly supposed, but a volitional act, as the reverse motion, namely, the folding back of the tooth, also is; so that, in simply feeding, the fangs are not erected. The folding back is accomplished by the ecto-pterygoid and spheno-palatine muscles, which, arising from the skull behind as a fixed point of action, in contracting draw upon the jaw-bones in such a way that the maxillary, and with it of course the fang, are retracted, when the tooth is folded back with an action comparable to the shutting of the blade of a pocket-knife. All the motions of the fangs are controlled by these two sets of antagonistic muscles, one of which prepares the fangs for action, while the other stows them away when not wanted.

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* It may be mentioned, as a fact of some interest, that, while in *C. confluentus* the fangs are generally shed or pushed out of place at variable periods of time (probably in twelve months), in *C. adamanteus atrox*, a species common in the Sonoran region, this shedding, or loss, frequently fails to take place, and it is common to find generally in the right side of the jaw of this species two or more fangs in position. In one specimen lately examined, three were found in position, and behind them three or four others were advanced in growth.

The fangs, when not in use, are further protected by a contrivance for sheathing them, so that they rest like a sword in its scabbard. This is a fold of mucous membrane, the *vagina dentis*, which envelopes the tooth like a hood, enwrapping its base, and slipping down over its length, partly as a consequence of its elastic texture, partly on account of its connections. Erection of the fang causes the sheath to slip off, like the finger of a glove, and gather in folds around the base of the tooth. This arrangement can be readily examined without dissection.

The poisonous fluid is secreted in a gland which lies against the side of the skull, below and behind the eye, of a flattened oval shape, obtuse behind, tapering in front to a duct that runs to the base of the tooth. Without going into the minute anatomy of the gland, it may be described as a sac, or reservoir, in the walls of which the numerous secretory follicles are imbedded; it is invested with two layers of dense, white, fibrous tissue, the outer of which gives off three strong ligaments that hold it in place. In a large snake, the entire gland may be nearly an inch long and one-fourth as wide, weighing, empty, ten or twelve grains, and having a capacity of ten or fifteen drops of fluid. There is no special reservoir for the venom, other than the central cavity of the gland. A certain dilatation of one portion of the duct, formerly supposed to be such storehouse, is due to thickening of its walls, without corresponding increase of capacity, resulting from muscular fibres which serve as a sphincter to compress the canal and prevent wasteful flow of the contents. There is further provision to this same end. When the tooth is folded back, the duct attached to its root is submitted to some strain, which pushes it against a shoulder of the maxillary bone, and tends to shut off the communication.

The injection of the venom, though to all appearance instantaneous, is a complicated process of several rapidly consecutive steps. Forcible voluntary closure of the jaws may always be, if desired, accompanied by a gush of the venom, owing to the arrangements of the muscles which effect such movement of the under jaw. These are the *temporales*, one of the three of which is situated in such relation to the poison-sac that its swelling in contraction presses upon the receptacle and squeezes out the fluid. The force of ejection is seen when the serpent, striking wildly, misses its aim; under such circumstances, the stream has been seen to spirt five or six feet. A blow given in anger is always accompanied by the spirt of venom, even when the fang fails to engage, from whatever cause. But since this result does not follow upon mere closure of the mouth, it is probable that the two posterior temporals ordinarily effect this end, the more powerful action of the anterior temporal (the one which presses upon the poison-sac) being reserved for its special purpose. There is one very curious piece of mechanism to be noted here. Since the serpent always snaps its jaws together in delivering a blow, the points of the erected fangs would penetrate the under jaw itself in case they failed to engage with the object aimed at, were there no contrivance for preventing such disaster to the snake. But there is a certain movement among the loose bones of the skull, perhaps not well made out, the result of which is to spread the points of the fangs apart in closure of the mouth, so that they clear the sides of the under jaw, instead of impinging upon it.

The complicated mechanism of the act of striking may be thus described:—The snake prepares for action by throwing itself into a number of superimposed coils, upon the mass of which the neck and a few inches more lie loosely curved, the head elevated, the tail projecting and rapidly vibrating. At the approach of the intended victim, the serpent, by sudden contraction of the muscles upon the convexity of the curves, straightens out the anterior portion of the body, and thus darts forward the head. At this instant, the jaws are widely separated, and the back of the head fixed firmly upon the neck. With the opening of the mouth, the spheno-palatines contract, and the fangs spring into position, throwing off the sheath as they leap forward. With delivery of the blow and penetration of the fangs, the lower jaw closes forcibly, the muscle that executes this movement causing simultaneously a gush of venom through the tubular tooth into the wound. There are also some secondary actions, though all occur at nearly the same instant. The mouth fixed at the wound drags upon it with the whole weight of the snake's body. This dragging motion is accompanied by contraction of the ectopterygoid and spheno-palatine muscles, which ordinarily fold back the tooth; but the fang being at this moment engaged in the flesh, the action of the muscles only causes it to bury itself deeper, and thus enlarge the puncture. The train of action seems to be, the reaching of the object, the blow, the penetration, the injection of the poison, and the enlargement of the wound. These actions completed, the serpent loosens its hold by opening the jaws, and disengages itself, sometimes not without difficulty, especially when the bitten part is small and the numerous small teeth have caught. The head is withdrawn, the fangs folded, the mouth closed, and the former coiled attitude of passive defense is resumed.

These remarks apply in substance to other species as well as to the one now under special consideration. Upward of eighteen species, not counting *Ancistrodon*, are described as inhabitants of the United States, nearly all of which occur in the West and Southwest. Our rattlesnakes fall in two genera, *Crotalus* and *Caudisona*, readily distinguished by the scutellation of the head. In the former, the top of the head is covered with a large number of small asymmetrical scales like those on the body; in *Caudisona*, the same region is shielded by a definite small number of large flat places symmetrically disposed. *Crotalus horridus* is a most widely dispersed species of Eastern North America, the only other species of the same portion of the continent being *C. adamanteus*, the "Diamond" rattlesnake of the South Atlantic and Gulf States. With the latter is found associated a species of *Caudisona*, namely, *C. miliarius*, the small spotted rattlesnake; but the best known species of the latter genus is *Caudisona tergeminus*, the common "Massasauga" of the interior States and of the Plains. Texas, New Mexico, and Arizona furnish the largest number of species.

Crotalus confluentus is a species of more and general distribution in the West, from the Mexican to the British boundary, and on both sides of the Rocky Mountains. It is associated in some parts with the Massasauga, but in other regions, as in the one now under consideration, it is the only known representative of its family. It appears to be particularly numerous in the region of the Yellowstone, where, according to Mr. Allen, it was estimated that two thousand were killed during the expedition of 1872. Farther northward, it is less abundant, though fairly to be considered common in the region of the Upper Missouri and Milk River and some of their northern tributaries. Along the northern boundary line, its distribution appears to be determined very nearly by the Missouri watershed, as limited by the Coteau. This carries its range somewhat into the British Possessions, so that it is probably the most northern species of the genus. It does not appear to exist along that portion of the line represented by the watershed of the Red River of the North, where none were observed by the commission. I shall have frequent occasion to allude to the great difference in the fauna and flora of these two portions of the line sharply divided by the Coteau of the Missouri. The presence among plants of the *Opuntia missouriensis* and the prevalence of *Artemisia*, the occurrence of *Centrocercus urophasianus* among birds, of *Cynomys ludovicianus* among mammals, and of *Phrynosoma douglasi* and *Crotalus confluentus* among reptiles, are some of the prominent features of the Missouri watershed as contrasted with that of the Red River. *C. confluentus* is also found extending to New Mexico, Utah, Colorado, Arizona, California, Nevada, and even to the islands of Santa Barbara Channel, California; but the typical *Crotalus* of the Sonoran region is *C. adamanteus atrox*, a subspecies of our Southern serpent, of the Pacific. *C. lucifer*, a well-marked and distinct form, is found in Arizona and the Pacific region.

The pairing season of these serpents is in midsummer, when they have several times been observed *in coitu.* Little, however, has been ascertained respecting their reproduction. About half the year, in most latitudes, they hibernate in holes in the ground. They have, however, been observed abroad after severe frosts in the Yellowstone region. At Fort Randall, on the Missouri, they were stated to reappear in May with the loosening of the ground from frost. As in the case of other species, there is a regular *annual*, or perhaps, as in some other Ophidians and as in Saurians, a more frequent casting of the skin. During the moult, they are reported to be specially venomous, but probably upon no other foundation than that at this time their sluggishness results in the accumulation of a large supply of the poisonous fluid. In one of the specimens secured were found the remains of a Prairie Squirrel (*Spermophilus richardsoni*), the most abundant mammal of the Milk River region; and it is probable that these animals, together with the allied species, form a large part of their subsistence.

While the venomous properties of these reptiles, not easily overrated, should suffice to ensure due caution in capturing or killing them, it is as well to remember that the utmost range of a rattlesnake's blow is less than its own length. They may readily be captured alive by pinning down the neck with a forked stick, and may be handled with impunity, when not too large and powerful, if seized immediately behind the head. In case of a strong snake, however, the power of constriction is sufficient to paralyze the muscles of both arms, as in the case of a person we knew who had seized two of these reptiles by the back of the neck. He had to be relieved by a bystander. A method employed in the South to capture the *C. adamanteus* is perhaps worthy of mention. A silk handkerchief is fastened to the end of a pole, which is held toward the reptile, which strikes fiercely at it, the fangs and teeth become engaged in the fibre of the silk, and a dexterous movement of the stick readily pulls out the fangs, and the reptile can be approached with safety.

There seems to be a special and peculiar enmity existing between the Rattlesnake and Moccasin and the Blacksnake (*Bascanium*) and "King Snake" (*Ophibolus getulus sayi*); these two latter species waging a constant warfare against the former, and invariably conquering, according to information received from reliable parties. After the conflict, the vanquished is eaten by the victor. In one case reported, a large Blacksnake (*Bascanium constrictor*) had seized a Rattlesnake (*Crotalus adamanteus*), and entwined two or more folds behind his head and several six or eight inches farther back; then by muscular effort had torn the body. It is a well-known fact that both Rattlesnakes and Moccasins will endeavor to get away from the "King Snake" (*Ophibolus getulus sayi*); and in the South this beautiful and harmless species is protected in view of this fact.

Genus CAUDISONA. *Laur.*

CAUDISONA TERGEMINA. (*Say*) *Cope.*

The Massasauga, or Prairie Rattlesnake.

Crotalus tergeminus, SAY, Long's Exped. R. Mts. i. 1823, 499.—HARLAN, Jour. Acad. Nat. Sci. Phila. 1827, 372.—COPE, Mitchell's Researches, App. 1861, 125.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177 (Yellowstone).

Crotalophorus tergeminus, GRAY, Synop. Rept. 78; Cat. Rept. Br. Mus. 18.—HOLBR. N. Am. Herpet. 2d ed. iii. 1842, 29, pl. 5.—DEKAY, N. Y. Fn. iii. 1842, 57.—BD. & GIR. Cat. N. A. Rept. 1853, 14.—BD. P. R. R. Rep. x. 1851, pl. 25, f. 9 (no text).

Caudisona tergemina, COPE, Check List N. A. Bat. and Rep. 1875, 34.

Crotalophorus ———, AGASS. L. Superior, 1850, 381, pl. 6, f. 6, 7, 8.

Var? (*Black Massasauga.*)

Crotalophorus kirtlandii, HOLBR. N. Am. Herpet. 2d ed. iii. 1842, 31, pl. 6.—GRAY, Cat. Br. Mus. 18.—BD. & GIR. Cat. N. A. Rept. 1853, 16.—BD. P. R. R. Rep. x. 1859, pl. 251, f. 11, 11 *bis* (no text).

Crotalophorus massasauga, KIRTL. *apud* BD. Serpents N. Y. 11, pl. 1, f. 2.

This species is distributed in prairie countries from Ohio and Michigan westward, finding its most western limit in the region of the Yellowstone. It is readily distinguished from any species of *Crotalus* by the presence of few (9) large symmetrical plates on the head, as in serpents generally, instead of numerous small scales, like those on the body. The rattle is much smaller than in *Crotalus*. The size varies from one to three feet. The ground-color above is brown, marked with blotches of deep chestnut-brown, blackish on the periphery, and margined with yellowish-white.

Family COLUBRIDÆ.

Genus HETERODON. *Beauv.*

HETERODON SIMUS NASICUS. (*B. & G.*) *Cope.*

Hog-nosed Snake; Sand Viper; Puffing Viper; Blowing Adder.

Heterodon nasicus, BAIRD & GIRARD, Stansbury's Exp. Great Salt Lake, 1852, 352.—BAIRD & GIR. Cat. N. A. Reptiles, 1853, 61, 157.—HALLOW. Sitgr. Rep. Expl. Zuñi and Colorado R. 1853, 147.—BD. P. R. R. Rep. 4, 1859, Whipple's Route, Reptiles, 41.—BD. P. R. R. Rep. x. 1859, Beckwith's Route, Reptiles, 19.—BD. U. S. Mex. B. Survey, ii. pt. ii. 1859, 18, pl. 11, f. 1.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 307.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69.

Heterodon simus subsp. *nasicus*, COPE, Check List Bat. and Rep. N. A. 1875, 43.

Specimen.

No. 1101. Big Muddy River, Montana. June 25, 1874.

The serpents of the genus *Heterodon* are medium-sized or rather small species, thick-set in form and sluggish, of repulsive aspect, not distantly resembling some of the venomous species, especially the Copperhead (*Ancistrodon contortrix*). The similarity to poisonous species is heightened by the flat, broad, triangular shape of the head and the habit of hissing when irritated. They are commonly called "Adders" and "Vipers", and are reputed venomous; nevertheless, they are perfectly harmless. They cannot be provoked to bite. The belief in the poisonous qualities is further heightened by the presence of two tolerably large teeth in each upper jaw, resembling fangs, these teeth being the ninth (?) of the series in some individuals, their bases being below the fifth upper labial. There is no groove present, nor is the tooth movable. We do not know that this fact has ever been before mentioned, although the post-palatine teeth are spoken of as being larger than others. These large teeth have, however, a sort of sheath over them, similar to the fang-sheath of *Crotalus*. There is an interval between the small anterior teeth, and these are not contained in the same sheath as the fang-like tooth, which in some cases is found to have in its sheath one or more smaller fang-like teeth. They may be distinguished from any other serpents of this country by the sharp-pointed and elevated end of the muzzle, the rostral plate being prolonged into a spur.

The present species finds its nearest ally in the *Heterodon simus* of the Southern States, sharing with this species the separation of the median plate behind the rostral from the frontals by the interposition of several small plates. From *H. simus* it is distinguished by the slaty-black, which occupies all or most of the under surface. The color above is an obscure grayish-brown, with very numerous darker blotches along the dorsal line, and usually other smaller ones on the sides. But the markings are never bold, sometimes nearly obsolete.

This is the most abundant and wide-ranging species of the genus, occurring throughout the West east of the Rocky Mountains. The specimen above noted is particularly interesting in the fact that it is the northernmost one hitherto recorded, demonstrating a wider range, not only of the species, but of the genus, than was before known. Mr. Allen procured it on the Yellowstone, and it appears to increase in numbers southward, being one of the more common serpents of New Mexico and Arizona. I am under the impression that I saw the same species beyond the Missouri watershed, at Chief Mountain Lake; but the individual was unfortunately not secured.[*]

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[*] Professor Cope, in his recent Check List, has seen fit to reduce the numbers of species of this genus to four, which are readily separated into two groups as follows:—

A. *Heterodon platyrhinus.*
  Heterodon platyrhinus subspecies *atmodes.*
    With the azygos behind the rostral plate in contact with the frontal plates.
B. *Heterodon simus* subspecies *simus.*
  Heterodon simus subspecies *nascius.*
    With the azygos behind the rostral plate separated by a varying number of small plates.

In this connection, it may be mentioned that if color should be taken into consideration as a specific marking, it seems that Baird and Girard's *H. niger* should be admitted as a subspecies of *H. platyrhinus*, for not only is there a very marked difference of coloration (some species of *H. niger* being entirely black), but as a rule the rostral of *H. niger* is much more developed than that of *H. platyrhinus*, and the dorsal carina are acute and very well marked, and there are obvious differences in the size of the scales. It is true that in examining a number of specimens of *H. platyrhinus*, *H. niger*, and *H. atmodes*, it will be found that a regular intergradation of color exists; but if *atmodes* is to be admitted as a good and valid subspecies of *H. platyrhinus*, it would seem that *H. niger* is entitled to the same respect. In an examination of the different specimens of *Heterodon* in the National Museum, Smithsonian Institution, the authors were fortunate enough to discover a species called *Heterodon kennerlyi* by Kennicott, in the Proceedings of the Acad. of Nat. Sci. Phila., 1860, pp. 336 and 337; and as after a careful examination of several specimens, the specific characters of them compare entirely with the type, the entire description is here given. The species naturally falls near the *B.* or *simus* group, in which the azygos is separated from the frontals, not by a varying number of plates, but by exactly two plates in five specimens and by three in one specimen. These specimens are from the following localities:—

1282. Matamoras, Texas.
7290. Lower Rio Grande.
5185. Fort Stockton, Texas.
8878. Southern Arizona.
8413. Southern Arizona.

A comparison of these specimens with eighteen well-marked species of *H. simus nasicus* shows that although these latter vary as to the number of scales separating the azygos and frontals, in no respect does it approach the regularity and systematic arrangement of the scales in *H. simus kennerlyi*.

HETERODON SIMUS KENNERLYI. (*Kennic.*) *C. & Y.*

H. kennerlyi, Kennicott.

SPEC. CHAR.—Head broad, very short anteriorly. Rostral plate very large. Loral plate very small, sometimes absent. Only two supplemental plates behind the azygos;

Genus EUTÆNIA. *Baird & Girard.*

Coluber, *Tropidonotus*, sp., AUCT.
Eutainia, BAIRD & GIRARD, Cat. N. Am. Reptiles, 1853.
Eutænia, emend.

To the few species of this genus known to the older authors under the names of *Coluber* or *Tropidonotus*, many were added, in 1853, by Baird and Girard, at the date of establishment of the genus *Eutænia*, a majority of the fifteen species described in the catalogue of the authors

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the latter is sometimes replaced by two symmetrical contiguous plates, and without any supplemental. The prenasal and prefrontal in contact with the posterior process of the rostral. Dorsal row of scales twenty-three, all carinated except the first and second, which are perfectly smooth. Ground-color light yellowish gray; a dorsal series of rather indistinct, rounded or subquadrate, brown blotches; a second series of smaller, circular spots, much darker and more distinct; below this a third and more indistinct series.

DESCR.—In its general form and appearance, this resembles the *H. nasicus*, with which it is sometimes found associated. The body, however, is rather shorter and thicker than in *H. nasicus*, and the head is broader, with the part of the head anterior to the eye decidedly shorter. The nasals are not as well developed longitudinally as in *H. nasicus*, but the result of this shortness of the anterior part of the head is seen in the very small loral, which is frequently wanting entirely. There is never more than one loral, while frequently two are seen in *H. nasicus*, in which the loral is in every case strikingly larger than in *kennerlyi*. The most striking difference between these species is in the number of small plates surrounding the azygos or postrostral. While in *H. nasicus* there are always at least ten of these, one or two of which margin the inner edges of the prenasals and prefrontals, there are never more than two, and frequently but one additional plate, in *H. kennerlyi*, and the prenasal and prefrontal are always in contact with the posterior process of the rostral. The azygos is short, nearly as broad as long, and usually there are just behind it two contiguous plates of about the same size, separating it from the postfrontal, but not from the prefrontal. Frequently, however, the azygos is longitudinally divided, and without any additional plates, but in contact with the rostral anteriorly, and the vertical posteriorly, and not separated from the postfrontals. The vertical, occipitals, superciliaries, and labials are much as in *H. nasicus*, though generally less developed longitudinally. The rostral is as large as in *H. nasicus*. The two outer dorsal rows are both perfectly smooth; in *H. nasicus*, the second is distinctly though delicately carinate.

The ground-color is light yellowish-gray, with a dorsal series of rather indistinct subquadrate or rounded blotches, two to two and a half scales long, and separated by intervals of one or two scales, rather wider anteriorly. Below this is a series of very distinct, purplish-black, circular blotches, covering four scales transversely and two longitudinally; below this one or more indistinct series of spots. This pattern of coloration is very similar to that of *H. nasicus*, but the ground-color is always lighter, and the dorsal spots are lighter and less distinct. The upper lateral series is of a purplish-black, and much more distinct, forming a prominent character.

Abdomen nearly entirely black, except a few yellow scuta. The head is marked as in *H. nasicus*, except that the nasals, prefrontals, and rostral are all yellowish; while, in the latter species, they are dark in front of the light transverse line which crosses the crown behind the rostral; and, in *H. kennerlyi*, the light line across the superciliaries and vertical is much broader than in *H. nasicus*. This species differs from *H. simus* in many of the same features as does *H. nasicus*. These, together with the small or absent loral and small number of supplemental plates, will readily distinguish it.

Rio Grande (*Dr. Kennerly*). Sonora.

just named being new. To these several more have since been added, chiefly by Mr. Kennicott and Professor Cope, from various parts of the West, the present number of current United States species being over twenty.

That the species of this large and difficult genus require thorough critical revision, with a reduction of the number of accredited species, will be evident to any one who undertakes the identification of any considerable series of specimens. A certain proportion of the specimens cannot be referred without hesitation to the described species they are supposed to represent, or, rather, may be referred, with about equal propriety, to more than one such species. This indicates either that the descriptions drawn from particular type-specimens are too exclusive to fairly afford specific diagnoses, or that the supposed species they represent are not valid, but blend with each other through intermediate specimens. There is unquestionably a gentle and complete intergradation between several of the accredited species.

Too much stress altogether has been laid, in the preparation of specific diagnoses, upon points which should properly be only adduced in illustration of the normal inherent range of variation of the individual, and have no value whatever as functions of the actual specific equation. For instance, "superior labials seven" and "superior labials eight" are expressions found in the diagnosis of certain species as distinguishing marks. Whereas the fact is, as any one may satisfy himself by examination of the first dozen specimens of *Eutænia* that come to hand, that the superior labials may be either seven or eight in different specimens of indubitably the same species, or that there may be eight of them on one side of the mouth, and seven on the other, in the same specimen. Subdivisions of the genus have been based upon the number of dorsal rows, whether 17, 19, or 21. Whereas it is a fact that different specimens vary a pair or two of scales in this respect, and that different parts of the body of the same specimen show a different number of rows of scales. Other matters, such as the width and sharpness of definition of the characteristic stripes, and the special tinge of coloration of these and other parts of the body, might be mentioned in similar terms.

As far as we have seen, the position of the lateral stripe may be a means of grouping the species. Though this varies within certain limits, mainly according to the width of the band, yet its position on the third and fourth, or on the second and third, dorsal rows, affords a ready means of distinguishing certain sets of species or varieties.

Along the northern boundary, *Eutænia* is the best represented genus of *Ophidia*, and indeed of *Reptilia*, not only in numbers of individuals, but of species as well. They occur in all situations, excepting, as a rule, the most arid regions, and are particularly numerous about the prairie pools and sloughs and along the banks of the various streams. All the species represented are more or less aquatic, particularly during the season of reproduction. Several hundred individuals fell under Dr. Coues's observation, of which a sufficiently large series of upward of fifty specimens, representing all the species known to occur in this region, was preserved.

These specimens include three perfectly distinct species. One of these is the wide-ranging *E. vagrans*, almost universally distributed in the West. Another is of the *sirtalis* type, and the third, more abundant and characteristic than either of the others, belongs to the *radix* group, and occurs under two varieties geographically distinguished. Without reference to other species of the genus, the three just indicated may be readily distinguished by the following analysis:—

A. Lateral stripe on the second and third rows of dorsal scales.
  a. Dorsal rows commonly 21; normally 8 superior labials.
    Body brown, with numerous small dark spots in two rows, nicking into the narrow inconspicuous stripes; no red; no bands on head; belly variably plumbeous .... *vagrans.*
  b. Dorsal rows commonly 19; normally 7 superior labials.
    Body pitchy-black, without spots, but mixed with small vermilion-red spaces; the stripes broad, firm, and perfectly continuous .... *sirtalis parietalis.*
B. Lateral stripe on the third and fourth rows of dorsal scales; superior labials normally 7; normally 21 rows of scales.
  a. Pitchy-black and equally so below and above the lateral stripe; dorsal and lateral stripes narrow; both gamboge-yellow, not contrasted with each other .... *radix.*
  a″. Olivaceous-black; lighter or interrupted below the lateral stripe; dorsal stripe broad, rich chrome-yellow, contrasted with the pale gamboge-yellow lateral stripe .... *radix twiningi.*

EUTÆNIA VAGRANS. *B. & G.*

Wandering Garter Snake.

Eutainia vagrans, BD. & GIR., Cat. N. A. Reptiles, 1853, 35 (Texas and California to Puget Sound).—GIR. U. S. Expl. Exped. Herpet. 1858, 154, pl. 14, f. 5–10.—BD. P. R. R. Rep. x. 1859, Beckwith's Route, Reptiles, 19, pl. 17.—COOP. & SUCKL. N. H. W. Terr. 1860, 297.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 305, 307.
Eutænia vagrans subsp. *vagrans*, COPE, Check List N. A. Bat. and Rep. 1875, 41.

Specimens.

1151.	Sweetgrass Hills.	August 3, 1874.
1157.	Sweetgrass Hills.	August 3, 1874.
1157 *bis.*	Sweetgrass Hills.	August 3, 1874.
1157 *ter.*	Sweetgrass Hills.	August 3, 1874.
1184.	Chief Mountain Lake.	August 23, 1874.

DESCRIPTION (from Nos. 1157, *bis*, *ter*).—This is a rather small species, the largest specimens seen being little over two feet in length, of slender form, and inconspicuous coloration, by reason of the narrowness of the bands, their dull color, and their indentation by the series of dark spots. On a general view, these spots are nearly as evident as the bands themselves, being quite blackish and set off upon the general dull grayish-brown ground-color. The under parts are dull slaty-gray, variously speckled and blotched with slaty-black, which in some cases prevails over the gray, especially on the hinder part of the body. The dorsal and lateral bands are alike pale dull yellowish. The dorsal stripe at its broadest points is one scale and two half scales wide; where encroached upon by the black spots, it is reduced to a single scale, or even interrupted altogether. These spots are generally opposite, giving a beaded character to the dorsal stripe; sometimes alternate, when the band appears zigzag; and both these conditions may be found at different points on the same specimen. The lateral stripe is less firm than the dorsal, since it is not only beaded along its upper edge by the lower one of the two series of lateral spots, but also blended to a degree with the color of the first row of scales along which it lies, as usual in those species in which this stripe is on the second and third rows. The first row of dorsal scales is colored like the belly, not like the back. The lateral dark spots, very numerous, and, as already said, quite conspicuous, are mostly alternate with each other, in some places opposite. The plates of the head are light brown, excepting the labials, which are colored like the body.

Twenty-one rows of scales is normal in this species, and the lateral stripe occupies the second and third. The head is large and especially wide, and the muzzle blunt. The superior labials are eight in two and a half of the three specimens under examination, the other half of the third specimen having seven. The discrepancy occurs, as usual, among the smaller anterior ones, the eye being in all situate over the fourth and fifth, counting from behind. The third from behind is the largest of the series. The length of the tail is contained 4⅖ times in the total length; 3⅖ times in the length of the body alone.

E. vagrans exhibits in a marked degree the variation in number of labials, also of the anterior and postorbital plates. The species is peculiarly characteristic of the Central region, but it is found exceedingly numerous in Utah, Colorado, and Arizona, generally in mountains.

The Wandering Garter Snake does not appear to be generally distributed along the northern boundary line. It was not met with during the first year of my connection with the Survey in any part of the Red River watershed, nor was it seen the second season except to the westward from the outliers of the Rocky Mountains to the main chain itself. We may conclude that its northwestern limits of distribution are indicated in these points. The species was originally described from the Pacific slope, Puget's Sound, California, and New Mexico, and has since been shown to be of very general dispersion in the West, on both sides of the mountains.

EUTÆNIA SIRTALIS PARIETALIS. (*Say*) *Cope*.

Parietal Garter Snake.

Coluber parietalis, SAY, Long's Exp. R. Mts. i, 1823, 186.—HARL. Journ. Phila. Acad. v. 1827, 349.
Eutainia parietalis, BD. & GIR. Cat. N. A. Rep. 1853, 28.
Eutænia sirtalis subsp. *parietalis*, COPE, Check List N. A. Bat. and Rep. 1875, 41.

Specimens.

1180.	Chief Mountain Lake.	August 19, 1874.
1193.	St. Mary's River.	August 28, 1874.

DESCRIPTION (No. 1180, Chief Mountain Lake).—This is one of the larger species of the genus, frequently attaining a length of three feet, although, at the same time, the average dimension is less than this. It belongs strictly to the *sirtalis* group, and in fact is not specifically separable from that species. It is a rather slender and elegant snake; and, when found inhabiting the clear cold mountain streams or lakes, one of the most beautifully colored representatives of the genus, the stripes being firm and bold, and the dark body-color being relieved with rich red in marked contrast. The coloration as observed in life in the Rocky Mountain specimens in August is as follows:—

The dorsal band, which is one scale and two half-scales broad, firm and perfectly continuous from head to end of tail, without indentation for the dark body-color, is pure yellow, fading to pale naples-yellow in alcohol. The tint is clearer than that of the lateral bands, which are rather of a heavier golden-yellow from some suffusion with the red that beautifully mottles the sides. The lateral stripe is as firm and continuous as the dorsal one, and broader, occupying two whole scales (of the second and third rows). The body-color is black, without obvious shade of brown or olivaceous, speckled between the scales with rich vermilion-red, which is very conspicuous on stretching the skin, forming an incomplete zigzag annulation. This red does not reach as high as the dorsal stripe, but extends through the lateral stripe, and occurs on the first dorsal row as a speck on the lower corner of each scale, and on the corresponding angle of the gastrosteges. The color is chiefly on the skin itself between the scales, but also suffuses the edges of many scales themselves. The first dorsal row of scales, which are much wider than the others, are colored like the belly; this lighter inferior boundary of the lateral stripe causes the stripe itself to appear less firm in outline below than above. The belly is not blackish or even slaty, but of a peculiar pale glaucous-greenish, much as in *sirtalis;* but black appears as a pair of small, round, lateral spots on each scute at its front border. The head is olivaceous-blackish, the rostral, lorals, and labials being like the belly. Length 31 inches; tail about ¼ of the total length—⅓ of the length of body alone. Gastrosteges 157; urosteges 64, all bifid. Superior labials seven on both sides; the fifth largest in this and a second specimen examined. In No. 1180, the labials of the left side have a small intercalated scale between the second and third. No. 1193, from the Saint Mary's River, August, is larger than the other, measuring about thirty-six inches; it is similar in general coloration, but less richly marked, the red suffusion being of less extent and intensity.

This slender and elegant species was only observed at and near the end of the Line, at the eastern base of the Rocky Mountains, in August. It was common in the clear cold waters of the lakes and streams, and appeared to be one of the most thoroughly aquatic species of the genus, being often seen swimming freely in deep water at some distance from the shore. At this season, all the female individuals observed were gravid with nearly matured embryos. Like other of the genus, the species is ovo-viviparous, the young being some six inches in length when born. Newly-born individuals are of an indefinite dark color, with pale bands and under parts, without red, but with two rows on each side of very evident blackish specks—markings like those that persist in the adults of *E. vagrans*, for example. In two young specimens found *in utero*, the genital or intromittent organs are external to the anus, and extremely large when compared with the size of the individual. The placental cord is attached a short distance in advance of the anus.

EUTÆNIA RADIX. (B. & G.)

Racine Garter Snake.

Eutainia radix, BD. & GIR. Cat. N. Am. Reptiles, 1853, 34 (Racine, Wisconsin).—KENN. *apud* COOP. & SUCKL. N. H. Wash. Terr. 1860, 299 (Minnesota).

Eutænia radix, COPE, Check List N. A. Bat. and Rep. 1875, 40.

Eutænia haydeni, KENN. *apud* COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 298, pl. 14 (Fort Pierre, Dakota).

Thamnophis haydeni, COPE.—HAYD. Trans. Amer. Assoc. xii. 1862, 177.

DESCRIPTION (No. 1027, Pembina, June 5, 1873).—This is one of the stoutest species of the genus. A specimen two feet long equals or rather exceeds in calibre a three feet long individual of *sirtalis* for example. The rapidly tapering tail, in a specimen 30 inches long, is 6½ inches, or contained about 4⅗ times in the total length—nearly 4 times in the length of body alone. The head is very short and thick, with a broad obtuse muzzle. The dorsal stripe, one scale and two half-scales broad throughout, is firm and continuous along the body, but less evident (sometimes extinguished altogether) on the tail. The lateral stripe is fairly two scales wide along most of the body, but only a scale and a half posteriorly, and but one scale on most of the tail; on the body it occupies the third and, for the most part, the fourth row of dorsal scales; on the tail it descends at once to the first row. Both dorsals and lateral bands are alike clear pale yellow, the former only occasionally deepening anteriorly into a more golden- or chrome-yellow. The body is olivaceous-blackish or obscure brownish-black, and of much the same tint above and below the lateral stripes. In the darkest and most "pitchy" black individuals, no markings are evident; in some lighter ones, there are indications of obscure dark spots, scarcely or not, however, traceable in definite rows. In all the specimens, the series of spots below the lateral line are well marked and distinguishable, and in many cases the line of spots just above the lateral line is fairly perceptible. The belly is pale glaucous-olivaceous, touched with blackish on the sides of the scutes, and sometimes this color mingles with the dark of the sides below the lateral stripe. Unlike those species in which the lateral band is lower down, there is not so much difference in the size or shape of the first and second dorsal rows. The superior labials are normally seven, sometimes eight on one or both sides; they are light-colored, like the belly, but each has a touch of blackish along the posterior border. The dorsal rows are normally 21, and all quite broad. All the dorsal scales are strongly carinated, giving the animal a roughened, scabrous appearance. The length is oftener 2 to 2½ feet than more, but at all ages the bulk of the snake, as already indicated, is considerable.

The specimen here described, a gravid female, and others of the numerous ones collected, agree perfectly with the original diagnosis of the type from Racine, Wis. (whence the name "radix" is derived), and equally well with Mr. Kennicott's subsequent description of a specimen from Fort Snelling, Minn. Throughout the Red River region, from Pembina to where the Coteau de Missouri crosses the line, it is the characteristic Ophidian, the principal and almost the only representative of its order, outnumbering all the others put together. Indistinguishable specimens also occur in the eastern portions of the Missouri region at the same latitude, though there the greater number are of the *twiningi* type, which farther westward prevails altogether.

In the more fertile portions of the Red River Valley itself, this snake may be found almost anywhere in the brush and herbage. Out on the dryer prairie beyond, it is chiefly confined to the pools and streams, or their immediate vicinity. Numbers are found basking together on the muddy borders of the sloughs, or among masses of aquatic vegetation, where they find ample subsistence during the summer months in the tadpoles, young frogs, and various water insects. They are themselves preyed upon by hawks, especially the Marsh Harrier (*Circus cyaneus hudsonius*) and Swainson's Buzzard (*Buteo swainsoni*). They are less active than some of the slenderer species, are readily caught, and when captured make little or no resistance. Only the largest individuals assume for the moment a defensive attitude and attempt to bite; most may be at once handled with impunity. The greater part of the females observed in July and August will be found pregnant, the young numbering sometimes as many as thirty or forty. Individuals were taken *in coitu* in September and part of October. These observations together indicate a period of gestation protracted for the greater part of a year. The snakes become much less numerous in the latter part of September, but Dr. Coues occasionally saw them abroad on warm days up to the middle of October, even after there had been snow, sleet, and freezing of the more shallow waters.

EUTÆNIA RADIX TWININGI. *Coues & Yarrow.*

Twining's Garter Snake.

DESCRIPTION (No. 1135, Two Forks of Milk River, July 15, 1874).—From the Coteau de Missouri westward, in the arid region of the Upper Missouri and Milk Rivers, the characters of *E. radix* undergo considerable modification. The difference is easily recognized in life by an observer familiar with both kinds. The principal character is seen in the increased breadth and intensity of coloration of the dorsal band, especially on the anterior portion. This band is of a rich chrome-yellow or reddish-golden, contrasting strongly with the clear pale yellow of the lateral stripe. This richly-colored cadmium-yellow band commences as a minute linear trace on the middle borders of the two scales just posterior to the occipitals; it then covers a single scale in rear of these, gradually increasing until three or even four scales are covered, finally settling down to thin scales which continue down two-thirds of body, then covers one whole and two halves; opposite the anus, and to its termination, it is confined to two half-scales. At its broadest part, near the head, it is full three scales broad, and sometimes even three and two half-scales in width. There are slight or no indications of darker mottling, even in the lighter-colored specimens. Below the lateral band, the dark color is usually much broken up with mottling of the color of the belly. With much the same general form as in *E. radix*, the head appears decidedly narrower and less obtuse. In the specimen 1135 there are eight upper labials on right side, seven on left; it is a gravid female.

This form corresponds perfectly with certain geographical faunal areas which are represented in the region under consideration, a fact in further evidence of the propriety of distinguishing it. It is abundant about the prairie pools of the Upper Missouri and Milk Rivers; its habits are the same as those of *E. radix*. It does not appear to extend into the Saskatchewan watershed.

Dedicated to Maj. W. J. Twining, United States Engineers, in recognition of his cordial coöperation in the scientific interests of the Boundary Commission, and in expression of our personal consideration.

List of specimens (of both forms).

1013.	Pembina.	June 5, 1873.
1019.	Pembina.	June 7, 1873.
1020.	Pembina.	June 7, 1873.
1027.	Pembina.	June 7, 1873.
1047.	Pembina.	June 24, 1873.
1065.	Turtle Mountain.	July 22, 1873.
1068.	Turtle Mountain.	July 23, 1873.
1089.	Mouse River.	Aug. 20, 1873.
1090.	Mouse River.	Aug. 20, 1873.
1091.	Mouse River.	Aug. 20, 1873.

1093.	Mouse River.	Aug. 25, 1873.
1100.	Big Muddy River.	June 25, 1874.
1117.	Porcupine River.	June 27, 1874.
1119.	Big Porcupine River.	June 29, 1874.
1130.	Frenchman's River.	July 8, 1874.
1132.	Near Frenchman's River.	July 12, 1874.
1132 *bis*.	Near Frenchman's River.	July 12, 1874.
1132 *ter*.	Near Frenchman's River.	July 12, 1874.
1135.	Two Forks of Milk River.	July 15, 1874.

To the foregoing species of Ophidians observed by the Boundary Commission may be added short notices of the following, known to occur in the Yellowstone region, and very probably extending farther north:—

EUTÆNIA PROXIMA. (*Say*) *B. & G.*

Say's Garter Snake.

Coluber proximus, SAY, Long's Exped. R. Mts. i. 1823, 187.—HARL. Journ. Acad. Nat. Sci. Phila. v. 1827, 353.

Tropidonotus proximus, HALLOW. Sitgreaves's Rep. Expl. Zuñi and Colorado R. 1853, 134, 146.

Eutainia proxima, BD. & GIR. Cat. N. A. Reptiles, 1853, 25.—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 69 (Yellowstone).—KENN. *apud* BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 16.

Eutænia proxima, COPE, Check List N. A. Bat. and Rep. 1875, 40.

This is a stout species, like *E. radix* and *E. twiningi*, the total length only about 3½ times that of the tail. The dorsal stripe is ochraceous-yellow; the lateral greenish-white or yellow on the third and fourth rows of scales; the dorsal rows are 19 in number. Carinæ of scales of dorsal region are of a whitish hue, which gives the species a streaked appearance, and the upper anterior border of the last row of scales is lined with white. There are also irregular white spots near the row of black ones above lateral line; these are more profuse in some places than others. The belly is greenish-white, more yellowish anteriorly. Its known range is east of the Rocky Mountains, from the region of the Yellowstone to New Mexico and Texas. Specimens are in the National Museum from Texas, California, Wisconsin, North Carolina, Mexico, &c. A specimen from Tomales Bay, California, is the type of *E. imperialis*.

EUTÆNIA SIRTALIS PICKERINGI. (*B. & G.*)

Pickering's Garter Snake.

a. SIRTALIS.

Coluber sirtalis, LINN. Syst. Nat. i. ed. 12, 1766, 383.—GM. Syst. Nat. i. pt. iii. ed. 13, 1788, 1107.—HARL. Journ. Acad. Nat. Sci. Phila. v. 1827, 352.—HARL. Med. and Phys. Res. 116.—STORER, Rep. Reptiles Massach. 1839, 221.

Tropidonotus sirtalis, HOLBR. N. Am. Herpet. iii. 1842, 41, pl. 11.

Eutainia sirtalis, BD. & GIR. Cat. N. A. Rept. 1853, 30.

Tropidonotus tænia, DEKAY, N. Y. Fauna, iii. 1842, 43.
Tropidonotus bipunctatus, SCHL. Ess. Physiogn. Serp. 1837, 320.
Tropidonotus tænia, DEKAY, N. Y. Zool. 1842, 43, pt. 13, f. 27.

b. PICKERINGI.

Eutainia pickeringii, BD. & GIR. Cat. N. A. Rept. 1853, 27 (Puget Sound).—GIR. U. S. Expl. Exped. Herpet. 1858, 150, pl. 13, f. 14-20.—COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 296.
Eutænia sirtalis subsp. *pickeringii*, COPE, Check List Bat. and Rep. N. A. 1875, 41.

This species was not procured by Dr. Coues, but is introduced on the strength of specimens from Fort Benton, Montana, collected by Lieutenant Mullan.

There are two well-marked forms of *E. sirtalis* subspecies *pickeringi*.

The spots confluent into a dark band.
a. With a lateral band.
b. No lateral band.

Baird and Girard say of the species,—"Body slender; black above, slate-color beneath; lateral stripe irregular, confluent with the light-colored intervals between the dark spots. This species exhibits great variation of color, principally in regard to black of abdomen." In the reserve collection of reptiles in the National Museum are quite a number of specimens of the two differently marked subspecies all from one locality, viz, Fort Benton, Missouri, collected by Lieutenant Mullan of the Army. In this subspecies, the differences in number of labials may be frequently seen.

TROPIDONOTUS SIPEDON. (*L.*)

Water Snake.

Coluber sipedon, LINN. Syst. Nat. ed. 12, 1766, i. 379.—GMEL. Syst. Nat. ed. 13, 1788, pt. iii. 1098.—HARL. Journ. Phila. Acad. v. 1827, 351; Med. and Phys. Res. 114.—THOMPS. Hist. Vermont, 1842, 118.
Tropidonotus sipedon, HOLBR. N. Am. Herpet. iii. 1842, 29, pl. 6.—DEKAY, N. Y. Fauna, iii. 1842, 42, pl. 14, f. 31.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.
Nerodia sipedon, BD. & GIR. Cat. N. Am. Reptiles, 1853, 38.
Coluber pœcilogaster, MAXIM. Reise Nord-Amer. i. 1839, 106.

This serpent appears to have been first found in the Upper Missouri region by the Prinz Maximilian von Neu Wied, who described it under the name of *Coluber pœcilogaster*; and it was subsequently observed in the Yellowstone country by Dr. F. V. Hayden. It is one of the commonest and best known species of the Eastern United States. The serpent of this region, however, may not be typical *sipedon*, but rather *woodhousii* or *erythrogaster*. Reptiles of this genus (comprising *Nerodia* and *Regina* of Baird and Girard) are the most completely aquatic ones of this country. The species of *Nerodia* proper are dark-colored, more or less evidently blotched, stout and rather repulsive, quite pugnacious when full-grown, and commonly regarded as venomous under the name of Water Adder, or Water Moccasin: needless to say, like other true *Colubrines*, they are perfectly harmless. Those of the other section, *Regina*, are slenderer, and banded lengthwise, much like *Eutænia*.

PITYOPHIS SAYI BELLONA. (*B. & G.*) *Cope.*

Say's Pine Snake.

a. SAYI.

Coluber sayi, SCHL. Ess. Physiogn. Serp. 1837, 157. (Not *Coronella sayi* of Holbrook or *Coluber sayi* of DeKay, which is *Ophibolus*.)

Pituophis sayi, BD. & GIR. App. Cat. N. A. Rept. 1853, 152 (in text under *Coluber sayi*, p. 151).—KENN. *apud* COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 300, pl. 22.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

b. BELLONA.

Churchillia bellona, BD. & GIR. Stansbury's Rep. Great Salt Lake, 1852, 350.

Pituophis bellona, BD. & GIR. Cat. N. Am. Rept. 1853, 66, 157.

Pityophis bellona, KENN. *apud* BD. P. R. R. Rep. x. 1859, Williamson's Route, Reptiles, 42.—KENN. *apud* BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 18.—BD. U. S. P. R. R. Rep. x. 1859, Beckwith's Route, Reptiles, 19.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 305.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69.

Pityophis sayi var. *bellona*, COPE, Check List Bat and Rep. N. A. 1875, 39.

Pituophis affinis, HALLOW, Proc. Acad. Nat. Sci. Phila. vi. 1852, 181.—HALLOW. Sitgr. Rep. Expl. Zuñi and Colorado R. 1853, 130, 146.

The species of this genus, known as "Pine" and "Bull" Snakes, are of large size, sometimes attaining a length of six feet or more. They are perfectly harmless, and appear of a rather sluggish and inoffensive disposition. They are light-colored (whitish, yellowish, or even reddish), but thickly blotched above with a dorsal series of numerous large brown or brown black-bordered spots, and other smaller lateral ones; on each side of the belly is usually found (as in the case of the present species) a row of black spots, one on each scutellum. Several upper dorsal series are lightly carinated; the rest are smooth. The tail is very short, about one-twelfth of the whole length, half-ringed above with black, and having lateral black spots. There is a dark stripe across the head from one eye to the other, continued behind each eye to the angle of the mouth. The head is very small, and the neck contracted. The general blotched character of the upper parts is somewhat in superficial appearance like that of *Crotalus confluentus* or *Heterodon nasicus;* but very little further observation is required to recognize the decided distinctions.

The best known species of this genus is the *P. melanoleuca*, the Common Pine or Bull Snake of the Eastern United States. An excellent and interesting account of the habits of this species, by the Rev. S. Lockwood, will be found in the American Naturalist for January, 1875.

Serpents of this genus vary notably in the construction of the plates of the head. A specimen of *P. bellona*, from the Yellowstone, collected by Mr. Allen in the expedition of 1873, presents the following case:—A large subpentagonal, shield-shaped vertical. Single large, triangular superorbital. A pair of moderate occipital and numerous small temporals. In advance of the vertical is a small azygos plate, wedged in between the connivent postfrontals. Two pairs of postfrontals. One pair of prefrontals. Two nasals, the nostril between them. A small loral. Two anteorbitals; the lower very small; the large, upper one bounding nearly all of the orbit anteriorly. Three small postorbitals. A large obtuse rostral. Eight superior labials, the eye over the fourth and fifth, the penultimate one largest.

After a careful examination of many specimens of *P. sayi bellona* and *P. sayi mexicana* in the National Museum, we find no absolute diagnostic value in the entire number of superior and inferior labials and number of dorsal scales, and are rather of the opinion that these two species should be grouped together under Baird and Girard's original name of *bellona*. Further investigation may show that *catenifer* Blainv. should be brought under the same head.

OPHIBOLUS GETULUS BOYLII. (*B. & G.*) *Cope.*

Ophibolus boylii, BD. & GIR. Catal. N. Am. Reptiles, 1853, 82.—BD. P. R. R. Rep. x. 1859, Williamson's and Abbott's Route, Reptiles, 11.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 20.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 305.

Lampropeltis boylii, COPE, Proc. Acad. Nat. Sci. Phila. 1860, 255.

Ophibolus getulus subsp. *boylii*, COPE, Check List N. A. Bat. and Rep. 1875, 37.

Coronella balteata, HALLOW. "Pr. Acad. Nat. Sci. Phila. vi. 1853, 236".—HALLOW. P. R. R. Rep. x. 1859, Williamson's Route, Reptiles, 14.

A specimen of this species, contained in a collection from the Yellowstone, offers the following characters:—The color is lustrous brownish-black, crossed at intervals of about an inch by narrow rings of pure white, which gradually widen on the sides to a breadth greater than that of the black interspaces. On the belly, these white rings are sometimes opposite, and then are continuous with the white coming down from the other side, and sometimes alternate, when they abruptly meet the black, producing a checkered pattern. These points are wholly irregular, both being observable in different parts of the same specimen. In this specimen, which is about 3½ feet long, there are in all forty-four rings, including some which are incomplete, that is, existing only on one side; for the rings on the back, as on the belly, are not always continued all around, some broken ones finding no fellow on the opposite side. In other specimens, there is also the greatest variety in all these details of pattern. The fore part and sides of the head are irregularly blotched with black and yellowish, and there are yellowish specks on the occiput.

This species is found abundantly in Pacific and Sonoran districts, and grows to a large size. The dark bands in Californian specimens in life are of a lustrous blackish-green bronze. Its discovery in Montana is an interesting fact, as there is but one specimen in the National Museum from that region.

The genus *Ophibolus* comprises a considerable number of species of very handsomely marked serpents, in all of which a black, brown, or red ground is crossed by light markings. The *Ophibolus getulus* is a common Eastern species, black like the present, and ringed with yellow, but the rings bifurcate on the sides.

OPHIBOLUS MULTISTRATA. (*Kenn.*)

Lampropeltis multistriata, KENN. Proc. Acad. Nat. Sci. Phila. 1860, 328. (By err. typog. for *multistrata*. "Fort Lookout, Nebraska", by err. for Fort Benton, Montana.)—HAYDEN, Trans. Amer. Phil. Soc. xii. 1862, 177 (Fort Benton).
Ophibolus multistratus, COPE, Check List N. A. Bat. and Rep. 1875, 37.

The locality of the original specimen is stated by its discoverer to be Fort Benton, Montana, not "Fort Lookout, Nebraska". Another error occurred in the original notice of the species, the name being printed *multistriata* for *multistrata*, in allusion to the number of rows of scales.

BASCANIUM FLAVIVENTRE. (*B. & G.*)

Yellow-bellied Black Snake.

Coluber flaviventris, SAY, Long's Exped. R. Mts. ii. 1823, 185.
Bascanion flaviventris, BD. & GIR. Cat. N. A. Reptiles, 1853, 96.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 20.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 69 (Yellowstone).

This species is dark olive-green above and bright yellow beneath, being distinguished from the usual style of *B. constrictor* by these characters, the last-named species being lustrous pitch-black above and ordinarily greenish-black below. These characters, however, are not diagnostic, as more or less yellow-bellied Eastern *constrictor* often occurs. Inasmuch as individuals of *B. constrictor*, which have not attained their adult state, resemble greatly in coloration *B. vetustum*, color cannot be relied upon as a specific point in diagnosis. The position of certain of the upper labial and their relation to the eye and that of the lower postorbital afford the most reliable means of distinguishing the species. In *Bascanium constrictor*, a line drawn slightly obliquely backward from the junction of the third and fourth upper labials will pass directly through the centre of the pupil of the eye. The same line drawn in *B. vetustum* would pass slightly anterior to the centre of the pupil, and in the latter species the lower postorbital lies in a notch between the fourth and fifth upper labials. In *B. constrictor*, the lower postorbital rests on the upper border of the fourth upper labial. In some cases, the position of the lower postorbital in *B. vetustum* differs on different sides of the same individual. The young of *B. vetustum* can hardly be distinguished from the young of *B. constrictor* except by the position of the lower postorbital. The description of the young by Baird and Girard, p. 94 of their Catalogue, is excellent, and should be relied upon, as young specimens differ so materially in coloration from adults.

The typical and best known species of this genus is the common Black Snake of the United States (*B. constrictor*). All the species agree in their slender form and perfectly smooth, lustrous scales and uniform coloration while adult, though the young are somewhat particolored. They grow to a large size, and are noted for their powers of constriction. They are among the most active and agile of our serpents, possessing eminent scansorial powers, and are persistent enemies of numerous small birds, whose nests they rob of the eggs or young.

CYCLOPHIS VERNALIS. (*DeK.*) *Günth.*

Coluber vernalis, DEKAY, MS.—HARL. Journ. Acad. Nat. Sci. Phila. v. 1827, 361; Med. and Phys. Res. 1835, 124.—STORER, Rep. Mass. Rept. 1839, 224.—HOLBR. N. Am. Herpet. iii. 1842, 79, pl. 17.—DEKAY, N. Y. Fauna, iii. 1842, 40, pl. 11. f. 22.—Thomps. Nat. Hist. Vermont, 1842, 117.

Chlorosoma vernalis, BD. & GIR. Catal. N. Am. Rept. 1853, 108.

Herpetodryas vernalis, HALLOW. Proc. Acad. Nat. Sci. Phila. 1856, 243.

Liopeltis vernalis, COPE, Proc. Acad. Nat. Sci. Phila. 1860, 560.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

Cyclophis vernalis, GÜNTHER, Cat. Col. Snakes Brit. Mus. 1853, 119.

Observed by Dr. Hayden on the Yellowstone.

In vol. v, Zoology, of Ex. for Expl. West of One Hundredth Meridian, mention is made by Dr. Yarrow, p. 539, of the discovery of this species at Abiquiu, N. Mex., and in the Am. Nat. vol. —, p. —, the same author relates that it was found by Lieutenant Carpenter in Colorado. These facts extend greatly its southern limit. *C. æstivus*, the Eastern and Southern species, has been found in New Mexico, Texas, and Western Missouri.

The two species are readily distinguishable: *C. vernalis* having 15 rows of smooth scales, 7 upper labials, 8 lower; and *C. æstivus* having 17 rows of strongly carinated scales, except the outer row, which is smooth, and the second slightly keeled; upper labials 7, lower labials 8.

SAURIA.

Family IGUANIDÆ.

Genus PHRYNOSOMA. *Wieg.*

PHRYNOSOMA DOUGLASSI. (*Bell*) *Gray*.

Horned Lizard; Horned "Toad"; Horned "Frog".

a. DOUGLASSI.

Agama douglassii, BELL, Trans. Linn. Soc. xvi. 1829, 105, pl. 10.—BELL, Isis, Bd. xxiii. 1830, 910.—HARL. Med. and Phys. Res. 1835, 141, f. 3.

Phrynosoma douglassii, GRAY, Griffith's An. King. ix. 1831, 44.—WAGL. Nat. Syst. Amph. 1830, 146.—WIEGM. Herp. Mex. 1834, 54.—HOLB. N. Am. Herpet. i. 1842, 101, pl. 14.—GRAY, Cat. Br. Mus. 1845, 227.—GIRARD, Stansbury's Rep. Expl. Great Salt Lake, 1852, 362, pl. 7, f. 6-9 (monographic).—COPE, Proc. Acad. Nat. Sci. Phila., 1866, 302.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69.

Phrynosoma douglassii subsp. *douglassii*, COPE, Check List N. A. Bat. and Rep. 1875, 49.
Tapaya douglassii, GIRARD, U. S. Ex. Ex. Herpet. 1858, 398, pl. 21, f. 1–5.—BD. P. R. R. Rep. x. 1859, Gunnison's and Beckwith's Route, Reptiles, 18.—BD. P. R. R. Rep. x. 1859, Williamson's and Abbott's Route, Reptiles, 9.—COOP. & SUCKL. N. H. Wash. Terr. 1860, 294.

b. ORNATISSIMA.

Phrynosoma orbiculare, HALLOW. Sitgreaves's Rep. Expl. Zuñi and Colorado Rivers, 125, pls. 8, 9. (*Nec* Wiegm.)
Tapaya ornatissima, GIR. U. S. Expl. Exped. Herpet. 1858, 396.—BD. P. R. R. Rep. x. 1859, Whipple's Route, Reptiles, 38.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 9.
Phrynosoma douglassii subsp. *ornatissimum*, COPE, Check List N. A. Bat. and Rep. 1875, 49.

Specimens.

1148.	Milk River at 49°.	July 26, 1874.
1153.	Sweetgrass Hills.	Aug. 3, 1874.
1154.	Sweetgrass Hills.	Aug. 3, 1874.

Representatives of the order *Sauria* are even fewer in number than those of the *Ophidia* in this latitude (49° N.), and the present is the only species which was observed by the Commission. Two others, however, are given beyond as probably occurring on the line east of the Rocky Mountains. Six, including the present species, are described from Washington Territory by Drs. Cooper and Suckley.

Douglass's Horned Lizard is the most abundant and widely diffused of the six or eight known United States species of the genus *Phrynosoma*. It ranges in fact throughout nearly all parts of the West, from the Mexican to the British Boundary, reaching the latter in the region of the Milk River. Its northernmost extension east of the Rocky Mountains at any rate appears to be only in the Missouri watershed. Dr. Coues obtained no indication of its presence in any part of the Red River region. It was found quite commonly on the Milk River, where this stream crosses the Line, and thence westward to the Rocky Mountains. In these latitudes, its range appears to coincide with that of *Crotalus confluentus*.

The present species may be known among the congeners by the orbicular shape of the body in connection with the very slight development of the cephalic spines, which are, in fact, no more than pointed scales, little different from those on other parts of the body. In some other species, the body is more elongated or oval, and certain plates upon the head are developed into long spines. The coloration is variagated and diffuse, and differs greatly in different individuals, especially farther south, where there is greater latitude in this respect than at the north. In this region of northernmost extension, the colors are almost uniform and quite pale, and the size is usually small. The coloration of the animal depends greatly upon the color of the ground where found, and it is our impression that this species possesses to a limited degree a modified power of chameleonization seen in other Saurians.

Although commonly called "Horned Toads", or "Horned Frogs", from hasty consideration of a superficial resemblance in shape to some of the

Batrachia, these animals are true Lizards, belonging to a large group which contains the Iguana, and numerous well known smaller species of this country. The presence of a tail, which is not found in adult life in the typical Batrachians; the scaly armor of the body, as contrasted with the naked skin of Batrachians; the mode of development, in not passing through a larval Tadpole stage, in which the species breathe in the water by means of gills; and the ambulatory, not saltatorial, mode of progression, are some of the prominent characteristics by which the *Phrynosomæ* show their true affinities.

Although of rather repulsive aspect, the Horned Lizards are inoffensive and perfectly harmless animals. They are rather sluggish, easily captured, make no resistance, and are readily tamed, when they make rather amusing pets for those who may desire to watch their sly and furtive ways. They feed principally upon flies, ants, and other small insects, which they catch by rapid protrusion of their viscid tongue, leaping, or rather running, at their prey sometimes. One that had been tamed would eat from the fingers, and also take a drop of milk, appearing greatly to relish it. Like other cold-blooded animals, they sustain long fasts without apparent inconvenience, and may be safely *mailed* alive, as curiosities, to almost any part of the country. We have never been able to keep them alive over four months.

The subspecies of this same *P. douglassii* (*ornatissimum*) is principally found in the Sonoran region, but specimens are in the National Museum from Utah and Upper Colorado and Pole Creek (wherever that may be).

SCELOPORUS CONSOBRINUS. *B. & G.*

Sceloporus consobrinus, BD. & GIR. Marcy's Rep. Expl. Red R. 1853, 224, pl. 10, f. 5–12.—BD. P. R. R. Rep. x. 1859, Whipple's Route, Reptiles, 37.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 5.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 303.—COPE, Check List N. A. Bat. and Rep. 1875, 49.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69 (from the Yellowstone).

Lately obtained by Mr. J. A. Allen on the Yellowstone, and has been found in Utah and Nevada. Belongs to the Sonoran and Central region, Oregon ?, and Texas.

Family SCINCIDÆ.

Genus EUMECES. *Wieg.*

EUMECES SEPTENTRIONALIS. (*Bd.*)

Northern Skink.

Plestiodon septentrionalis, BD. Proc. Acad. Nat. Sci. Phila. 1858, —.—BD. P. R. R. Rep. x. 1859, Whipple's Route, Reptiles, 38, pl. 24, f. 2.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

Eumeces septentrionalis, COPE, Check List N. A. Bat. and Rep. 1875, 44.

Originally described from Minnesota, and also known to occur in Nebraska and Kansas.

B.—BATRACHIA.

ANURA.

Family BUFONIDÆ.

Genus BUFO.

Bufo lentiginosus fowleri. (*Putnam, MSS.*)

Fowler's Toad.

Bufo americanus var. *fowleri*, "Putn. MSS."
Bufo lentiginosus subsp. *fowlerii*, Cope, Check List N. A. Bat. and Rep. 1875, 29.*

Specimens.

1006.	Pembina.	June 3, 1873.
1012.	Pembina.	June 5, 1873.
1028.	Pembina.	June 7, 1873.
1031.	Pembina.	June 7, 1873.
1066.	Turtle Mountain.	July 23, 1873.
1070.	Turtle Mountain.	July 24, 1873.
?1086.	Mouse River.	Aug. 17, 1873.
?1092.	Mouse River.	Aug. 25, 1873.

Abundant along the line throughout the Red River watershed, where it was the only species observed. Westward, in the Missouri and Milk River region, it appears to be entirely replaced by the following species:—

Bufo columbiensis. *Bd. & Gir.*

Columbia Toad.

Bufo columbiensis, Bd. & Gir. Proc. Acad. Nat. Sci. Phila. 1853, 378.—Gir. Proc. Acad. Nat. Sci. Phila. 1854, 87.—Gir. U. S. Expl. Exped. Herpet. 77, pl. 5, f. 4-9.—Bd. P. R. R. Rep. x. 1859, Williamson's and Abbott's Route, Reptiles, 12.—Coop. & Suckl. N. H. Wash. Terr. 1860, 304.—Allen, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 70.—Cope, Check List N. A. Bat. and Rep. 1875, 29.

Specimens.

?1177.	Kootanie River.	Aug. 17, 1874.
1181.	Chief Mountain Lake.	Aug. 19, 1874.
1183.	Chief Mountain Lake.	Aug. 23, 1874.
1190.	Chief Mountain Lake.	Aug. 24, 1874.
1191.	Chief Mountain Lake.	Aug. 24, 1874.

This species, originally described from the Pacific slopes, and not generally recognized as occurring east of the Rocky Mountains, was found to be very common in the above-named localities. It was also procured on the Yellowstone by Mr. Allen. The palmation of the feet renders it much more decidedly aquatic in habit than is usual in this genus. I found it swimming freely in the lake, as well as in various streams and pools about the eastern base of the Mountains. Specimens were taken from the stomach of *Salmo namaycush* and other fish of the same genus in this locality, further indicating its aquatic nature. The colors of the specimens inhabiting these clear cold waters are notably fresh and firm.

Family RANIDÆ.

Genus RANA.

RANA HALECINA. *Kalm.*

Leopard Frog.

"***Rana pipiens***, GM.", Syst. Nat. 13th ed. 1788, 1052 (*nec auct.*).

Rana halecina, KALM.—DAUD. Hist. Nat. Rept. viii. 1803, 122.—HARL. Journ. Acad. Nat. Sci. Phila. v. 337; Med. and Phys. Res. 102, 224.—DEKAY, N. Y. Fauna, iii. 1842, 63, pl. 20, f. 19.—HOLBR. N. Am. Herpet. iv. 1842, 91, pl. 13.—BD. P. R. R. Rep. x. 1859; Whipple's Route, Reptiles, 45.—COOP. & SUCKL. N. H., Wash. Terr. 1860, 304, pl. 29, f. 7.—HAYD. Trans. Amer. Phil. Soc. xii. 1862. 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 301.—ALLEN, Proc. Bost. Soc, Nat. Hist. xvii. 1874, 70.

Specimens.

1064, *bis*, *ter*, etc.	Near Pembina Mountains.	July 9, 1873.	Numerous specimens.
?1081.	Souris River.	Aug. 16, 1873.	
?1081, *bis*.	Souris River.	Aug. 16, 1873.	
1118.	Wolf Creek.	June 28, 1874.	
1118, *bis*.	Wolf Creek.	June 28, 1874.	
?1167.	Head of Milk River.	Aug. 14, 1874.	

A series of specimens, demonstrating the general dispersion of the species in the permanent waters of the region explored. It occurs in Washington Territory, and I have found it in New Mexico and Arizona, as well as in various localities in the Eastern United States, where it is one of the most abundant and well-known species, conspicuous in its size, rich coloration, and agility.

The common Western form is *Rana halecina berlandieri*, which is only distinguished from *R. halecina* by its larger size and generally coarser and more pustulated skin. The specimens represent "*berlandieri*", but this we are disinclined to adopt without further investigation of its alleged distinctness.

Rana septentrionalis of Baird (Proc. Phila. Acad. 1854, p. 61) is accredited with a range from "Canada to Montana", but was not observed.

Family HYLIDÆ.

Genus CHOROPHILUS.

CHOROPHILUS TRISERIATUS. (*Maxim.*)

Helecoetes triseriatus, MAXIM. Reise Nord-Am. i. 1839, —.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.
Chorophilus triseriatus, COPE, Check List N. A. Bat. and Rep. 1875, 30.

Specimens.

1123, *bis*, *ter*, etc. Frenchman's River. July 6, 1874.

This small species was found in the greatest abundance in prairie pools* and streams at various points along the line, especially at Frenchman's River, where numerous specimens were secured. It forms a considerable portion of the food of the *Eutæniæ* of this region. Specimens are also in the Natural Museum from Colorado, New Mexico, Nebraska, and Kansas.

Family AMBLYSTOMATIDÆ.

Genus AMBLYSTOMA. *Tsch.*

AMBLYSTOMA MAVORTIUM. *Bd.*

a. MAVORTIUM.

Ambystoma mavortia, BD. Journ. Acad. Nat. Sci. Phila. 2d ser. i. 1849, 292, 284 (New Mexico).
Ambystoma mavortium, HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 352.
Amblystoma mavortium, BD. P. R. R. Rep. x. 1859, Gunnison's and Beckwith's Route, Reptiles, 20.—COPE, Proc. Acad. Nat. Sci. Phila. 1867, 184.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 70.—COPE, Check List N. A. Bat. and Rep. 1875, 25.
Amblystoma proserpina, BD. & GIR. Proc. Acad. Nat. Sci. Phila. 1852, 173.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1869, Reptiles, 29, pl. 35, f. 7–14.
Ambystoma proserpine, HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 354.
Ambystoma maculatum, HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 355.—HALLOW. Proc. Acad. Nat. Sci. Phila. 1857, 215.
Desmiostoma maculatum, "SAGER, Penins. Journ. Med. 1858, 428".
Camarataxis maculata, COPE, Proc. Acad. Nat. Sci. Phila. 1859, 123.
Ambystoma nebulosum, HALLOW. Proc. Acad. Nat. Sci. Phila. 1852, 209 (Arizona).—HALLOW. Sitgreaves's Rep. Expl. Zuñi and Colorado R. 1853, 143, pl. 20.—HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 352.
Amblystoma? nebulosum, COPE, Proc. Acad. Nat. Sci. Phila. 1866, 300.

b. CALIFORNIENSE.

Ambystoma californiense, GRAY, Proc. Zool. Soc. Lond. 1853, 11, pl. 7 (Monterey).—HALLOW. Journ. Phila. Acad. Nat. Sci. iii. 1858, 355.
Amblystoma mavortium subsp. *californiense*, COPE, Check List N. A. Bat. and Rep. 1875, 25.

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* These pools also furnished great numbers of an interesting Phyllopod, *Lepidurus couesi* of Packard.

Specimens.

1045.	Pembina.	June 24, 1873.
1057.	Pembina.	June 28, 1873.
1071.	Turtle Mountain.	July 28, 1873.
1074.	Turtle Mountain.	Aug. 11, 1873.
1074 *bis*.	Turtle Mountain.	Aug. 1, 1873.
1137.	Two Forks of Milk River.	July 15, 1874.

Common in suitable situations all along the line. In all the specimens observed, the metamorphosis from the *Siredon* stage was completed at a length of four or five inches. In other regions, I have procured the same species, still in the *Siredon* stage, but nearly twice as large. Individuals were found in damp places about the buildings at Fort Pembina and vicinity, and still more numerously around the pools at the western base of Turtle Mountain. They wandered freely away from the water, and in some instances entered our tents.

In life, the coloration of the specimens examined was clear olive above, more glaucous or greenish-white below, everywhere variegated in bold pattern with black.

In addition to the foregoing, the only species of the genus observed by the commission, a second is described as inhabiting the region about the eastern portions of the line. This is the *Ambystoma laterale* of Hallowell (Journ. Acad. Nat. Sci. Phila. iii. 1858, 352), now regarded as a variety of *Amblystoma jeffersonianum* Bd. (*op. cit.* i. 1849, 283) (*Xiphonura jeffersoniana* Tschudi, Class. Batrach. 1838).

Amblystoma aterrimum Cope (Proc. Acad. Nat. Sci. Phila. 1867, 201) is a species described from the Northern Rocky Mountains, in the region explored by Lieutenant Mullan.

ART. XII.—ON CONSOLIDATION OF THE HOOFS IN THE VIRGINIAN DEER.

BY DR. ELLIOTT COUES, U. S. A.

Mr. George A. Boardman, of Calais, Me., has obligingly submitted to my examination the feet of a Deer (*Cariacus virginianus*) displaying the abnormality of consolidation of the hoofs.

The state of the specimens does not permit any examination of the condition of the bones themselves. As well as can be judged from inspection, and by feeling through the dried skin which covers them, they are entirely normal.

The false hoofs are present and of ordinary characters.

The malformation seems to be confined to the horny substance of the true hoof, which is consolidated with its fellow of the opposite. The union is complete along the whole inner margins of the hoof, excepting a notch between the two halves at the end less than half an inch in depth.

Viewed from above, the hoof shows its composition by lateral halves, there being a profound longitudinal sulcus, along the bottom of which groove is the line of union, complete to within less than half an inch of the end.

On the plantar surface, the confluence of the hoofs gives a nearly plane surface, without special indication by a sulcus of the line of union, to within about an inch of the end, where a median depression, bounded by raised edges, marks the seam, the extremity being nicked, or notched, as already said. The outer border of the sole of the foot is smoothly rounded off behind; but anteriorly, for about half the length of the whole hoof, the margins are raised and sharp-edged,—this edge terminating behind in a scroll-like inversion. This sharp margin is the outer edge of each hoof along that portion of its length which is ordinarily applied to the ground.

The profile view of the hoof displays the deformity of excessive growth in length, the whole hoof being unnaturally elongated, with the end curved upward, rendering the fore border strongly concave in profile, and causing the hind and under border to fall into one long and continuous curve, with convexity downward.

Besides such elongation and curvature, the whole hoof is unnaturally contracted, or laterally compressed; the sides, which should expand downward and outward, curving downward and toward each other, so that the greatest width of the plantar surface between the lateral sharp edges is much less than the diameter of the hoof across the top.

Length of the hoof in front (chord of the concave border) nearly two inches. Entire length of the hoof behind (chord of the convex curve from base to tip) three inches. Greatest width of the hoof, both halves together, less than one inch—this measurement being taken near the base of the hoof behind. Width of either half, at a point opposite ends of the hairs in front, only *four-tenths* of an inch.

The general constriction of the hoof is of course of a part with its consolidation; while its lengthening and curvature are doubtless the progressive result of growth under circumstances not permitting the normal spread and play of each hoof upon the ground.

This monstrosity is clearly a freak in an individual case, belonging to the general category of web-fingering; and it is not to be compared with the more profound modifications of the pig's foot which I describe in the succeeding article. Its occurrence is so obviously and seriously disadvantageous that it could scarcely be perpetuated to any extent.

ART. XIII.—ON A BREED OF SOLID-HOOFED PIGS APPARENTLY ESTABLISHED IN TEXAS.

By Dr. Elliott Coues, U. S. A.

My attention has recently been called to this matter by communications from a valued correspondent, Mr. G. W. Marnock, of Helotes, Bexar County, Texas, who has further laid me under obligations by transmitting the well-prepared specimen from which the accompanying illustration has been made.

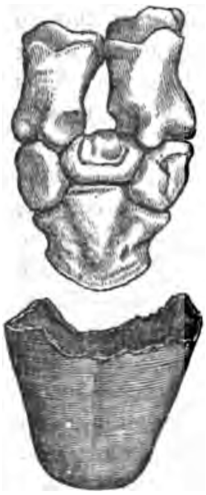
Like the monstrosity of cleft-hoof occasionally witnessed in the horse or ass, the peculiarity of the solid hoof is already known to occur in the domestic pig. Thus, I am informed by Professor Baird of his recollection of such a case, there having been many years ago a number of solid-hoofed pigs in the possession of a person residing near Carlisle, Pa., who specially valued them for some advantage which the peculiarity was supposed to confer. Professor Leidy also tells me that the same thing is within his knowledge.

As in the case of the monstrosity of cyclopism, which is of comparatively frequent occurrence in these animals, however, the formation of the solid hoof seems to have been regarded as a mere freak of nature, or monstrosity in the usual sense of that term; whereas I gather from my correspondence with Mr. Marnock that the solid-hoofed pigs of Texas are established as a race which transmits its peculiarities to its offspring as surely as it does any other portion of its structure. I should judge from Mr. Marnock's remarks that the solid-hoofed pigs of his locality constitute a large proportion, if not a majority, of the species.

The peculiarity is so firmly established that no tendency to revert to the original and normal form is observable in these pigs. Mr. Marnock informs me that the cross of a solid-hoofed boar with a sow of the ordinary type produces a litter the majority of which show the peculiarity of the male parent.

He alludes to a popular belief which ascribes the origin of this breed to crossing with the peccary,—this being of course fallacious.

The upshot of this modification of the foot is that a strictly artiodactyle animal is transformed into an imperfectly perissodactyle one. As far as the hoof itself is concerned, the pig is completely solidungulate. It is also perfectly "odd-toed", or single-toed, in the terminal phalanges, anchylosis of which produces a single broad phalanx in the axis of the limb. Above this, however, the other two phalanges, medial and proximal, of each of the two principal lateral digits, remain perfectly distinct, and, moreover, widely separated from each other by intervention of a special ossicle, doubtless a sesamoid, in the axis of the foot immediately above the single terminal phalanx.



The actual structure, both of the bones of the digits and of the horny hoof, will be appreciated from a glance at the accompanying figure. This is engraved of life size, front view, with the hoof withdrawn sufficiently to display all the parts. The preparation is from a young subject about three months old, in which the proximal epiphyses of the phalanges are still evident. The pair of distinct proximal phalanges of normal characters, or nearly so, are seen to be succeeded by nodular medial phalanges, which latter, as well as the distal extremities of the proximal phalanges, are widely separated by intervention of a special ossicle in the axis of the foot. To these succeeds a single broad and flattened terminal phalanx, obviously composed of the pair of distal phalanges anchylosed together. In this specimen, the anchylosis is complete, even at so early an age of the subject; its condition apparently being not the result of progressive confluence of the two bones, but of their original connation.

The terminal phalanx is flattened and somewhat scooped out on its posterior aspect, without trace of previous separation into halves. In front, however, as shown by the figure, it presents a central triangular elevation, apex downward, and base articulated with the nodular ossicle above it, as if a wedge of bone had been thrust into the axis of the limb between the primitive distal phalanges. This wedge-shaped piece of bone is completely anchylosed with the present single distal phalanx; and below its apex the edge of the bone is perfectly continuous across the axis of the foot.

The central nodular ossicle, which I have already mentioned as a sesamoid, articulates with all five of the bones of the foot. I cannot account for its presence unless it be a displaced sesamoid, such as for example that which is normal beneath the base of the distal phalanx of the horse, and known to some as the "os subarticulatum". In the normal pig's foot, there are several pairs of sesamoids beneath the phalangeal articulations; and the bone in question may be regarded as a confluence of the pair at the base of the distal phalanges, or of two pairs at the bases of the medial and distal phalanges respectively. The displacement of these sesamoids brings the ossicle into position in the axis of the foot between instead of under the bones. Or, it may be that this ossicle is a confluent pair of sesamoids from beneath the basis of the medial phalanges, and that the wedge-shaped piece of bone which appears upon the front of the distal phalanx, consolidated therewith, represents sesamoids from beneath the distal phalanges.

The horny hoof encases these bones as far as the distal extremities of the proximal phalanges. It is perfectly whole, or "solid", as seen in the figure. In front, there is a slight, though evident, vertical line of impression along the middle, indicating its composition from lateral halves. On the sole of the hoof, there is a broad, angular elevation of horny substance, apex forward, and sides running backward and outward to the lateral borders of the hoof, the whole structure being curiously like the frog of the horse's hoof. In fact, it is a frog, though broad, flattened, and somewhat horseshoe-shaped, instead of being narrow, deep, and acute, as in the actual frog of the horse. This arcuate thickening of the corneous substance occupies about the middle third of the whole plantar surface of the hoof.

Viewing the apparent establishment of this pseudo-perissodactyle structure in an artiodactyle, the question arises whether we have not, under our eyes, an example of a way in which a solidungulate may be evolved from a pluridigitate stock—though of course the one case is by enlargement of a single median digit and reduction of lateral digits, while in the present instance a bone in the axis of the limb is produced by failure of fission between lateral paired digits. Nothing is more certain than that the present solid-hoofed horse has come by direct descent, with modification, from its several-toed ancestors of the Tertiary. In the present case, we seem to have the initial steps of an actual transformation which may in time result in modifications to which ordinal value may attach. It may be suggested that this modification is one of progressive adaptation of the animals to their freely-ranging state on the prairies of the country, just as the series of modifications which the primitive horse's foot has undergone in adaptation to the making of the most serviceable hoof for running on hard ground at the expense of any other function.

ART. XIV.—PROFESSOR OWEN ON THE PYTHONOMORPHA.

BY E. D. COPE.

The British Museum has recently obtained the Van Breda collection of fossils, which includes a valuable series of Mosasauroid remains from Maestricht, the locality which furnished to Cuvier the typical specimen of the *Mosasaurus giganteus*. Professor Owen has improved the opportunity to study this material with that already in possession of the museum, some of which was derived from North American sources.

In pursuing this subject, Professor Owen has done me the honor to study my contributions to it, a summary of which appears in the second volume of the Final Report of the United States Geological Survey of the Territories under Dr. F. V. Hayden. He follows my determinations and conclusions, and criticises them in the light of his long experience. As a portion of this criticism is adverse to what he supposes my conclusions to be, I propose on the present occasion to give such a brief review of Professor Owen's paper* as my other immediate occupations will permit. I premise that this cannot now include a complete review of the subject, nor the exposition of several parts of it which have not yet received the attention of Professor Owen or of any one else.

Professor Owen's references to my work may be included under three heads, viz:—First, as to matters of fact or observation; second, as to determination of homologies of parts; third, as to the estimation of affinities as derived from the preceding branches of the subject. I now consider—

I.—QUESTIONS OF FACT.

The many observations as to the structure of the order of *Pythonomorpha* recorded by me in the volume already referred to are confirmed by Professor Owen with a single exception. He correctly describes the vertebræ of the genus *Mosasaurus* as without the zygantrum and zygosphene articulation, and proceeds to say (p. 709), in reference to my ascription of this structure to the genus *Clidastes*, that the structure of *Mosasaurus* "is repeated in plates xviii, xix, xx, xxi, xxiii, xxiv, xxvi, xxvii, xxix, xxx, xxxiv, and xxxv of Professor Cope's great work; in every figure the zygosphene and zygantrum are absent." And again,—"In the plates xviii and xxiii given to the vertebræ of the species [*Clidastes*] *stenops* and *planifrons*, the parts and processes are as usual not indicated." All this is a remarkable oversight on the part of Professor Owen. He will find the zygosphene distinctly represented on figs. 5 *a* and 5 *b*, pl. xviii; figs. 3 *b*, 3 *d*, 6 *b*, 6 *c*, pl. xix; fig. 15 *d*, pl. xxi; figs. 3 *c* and 3 *d*, pl. xxiii; fig. 4, pl. xxiv; and the zygantrum in nearly as many figures. He will also find them well represented in the figures of vertebræ of *Clidastes* on plates v and xii of the Extinct Batrachia and Reptilia of North America. In order to substantiate his position, he copies from my work a figure of a vertebra of *Clidastes stenops* from which the zygosphene has been accidentally broken away.

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*Quarterly Journal of Geological Society, London, 1877, p. 682.

Professor Owen places me in the attitude of committing error in questions of fact in regard to the limb-bones and their arches in the *Lacertilia* and *Ophidia*. My statement is,—"As there are many *Lacertilia* without limbs, and some serpents with them, their presence in this order is irrelevant in this connection, especially as the arches supporting them are most like those of tortoises and Plesiosaurs." Professor Owen then proceeds to state that there are only twenty-three genera of *Lacertilia* with reduced limbs, and "extremely few" where they may be considered to be rudiments. Professor Owen can hardly have had in mind the developments of herpetology during the last five or ten years in making this assertion; for the genera of lizards now known in which the limbs are rudimental may safely be said to be numerous, and those without even rudiments are not a few. Professor Owen appears to have overlooked the entire suborder of the *Amphisbænia*, which are all limbless with the exception of one genus. He then criticises my reference to serpents with limbs, and observes:—"In certain *Ophidia* dissection has revealed a small styliform bone on each side the cloaca; in a few it is tipped with horn in the shape of a claw. . . . Whether these appendages to the generative parts be homologous with the 'claspers' of sharks or with the ventral fins, and, if the latter, with the hind limbs of lizards, is yet an open question." Reference to the numerous genera and species of serpents which possess rudimental hind limbs, as well as to the two suborders which possess a pelvis, is here entirely omitted, and the demonstration of the homology of the anal claws above mentioned with true hind limbs appears to be unknown to Professor Owen. Besides the *Boidæ*, *Pythonidæ*, and *Xenopeltidæ* known to Professor Owen as possessing these rudimental limbs, there are the *Lichanuridæ*, *Tortricidæ*, and *Stenostomidæ;* while the *Typhlopidæ* and *Stenostomidæ* possess a pelvis—the latter family with ilium, ischium, and pubis, as ascertained by Peters. This pelvis is more complete than that of various *Lacertilian* genera of the *Diploglossa* group, or of the suborder of the *Amphisbænia*, which consists, according to Stannius, of a rudimental ilium only. My statements on this point are borne out by the facts. My assertion as to the resemblance of the scapular and pelvic arches to those of tortoises and Plesiosaurs is true in view of the fact that the former has no inferior connection with a sternum, so far as known, an element absent in the orders named and the *Ophidia*, but present in the lizards, although not universally so.

Another question of fact is raised in regard to the possibility of the lateral horizontal flexure of the mandibular ramus in the various genera of *Pythonomorpha.* My critic states,—"In *Python* the outer plate of the dentary is deeply notched behind by a long angular depression which receives a process of similar shape of the angulo-surangular element. In ***Mosasurus*** as in ***Monitor***, the outer plate of the dentary terminates in a subvertical line; this is curved in *Iguana*, less so in ***Monitor***, still less in ***Mosasaurus***, where it seems to have suggested to Professor Cope the idea of a movable articulation with the hinder part of the ramus: but the relative overlapping position of the mandibular elements, causing the angular break of the line" [of the posterior border of the dentary] "on the outer side of the ramus, and in a great degree of the inner surface of the ramus, must have as effectually opposed such flexion in *Mosasaurus*, as is the case with Lacertians and *a fortiori* with Ophidians."

I have not had the opportunity of studying a perfect mandibular ramus of a species of the genus *Mosasaurus;* but I have numerous mandibles of *Platecarpus*, *Liodon*, and *Clidastes.* In all of these, the mobility is indicated by the character of the adjacent extremities of the segments of the lower jaw, as well as by the form of the proximal end of the *os quadratum*, by which that jaw is mediately articulated with the skull. There is no "overlapping of the mandibular elements causing the angular break" in these genera, either in the horizontal or vertical lines, although the inferior portion of it, where the ball-and-socket articulation is found, forms a slight angle with the remaining portion of the hinge. The anterior extremities of the surangular and coronoid are contracted to an obtuse edge, which fits into a groove or rabbet of the dentary and splenial elements, so as to form a movable joint, the two segments of the ramus being held together by a lamina of bone which in life was doubtless perfectly flexible. This flexure is rendered necessary when the jaw is opened widely by the form of the proximal end of the *os quadratum.* This extremity forms a sliding joint with the inferior face of the opisthotic; and as it is bent or curved in form, its movement necessarily causes a rotation of the quadrate round its vertical or long axis. This rotation of course throws the proximal part of the mandibular ramus outward; and to permit this movement, the joint near the middle of the latter is clearly adapted. The degree of flexure is dependent on the degree of rotation, and that in turn on the curvature of the proximal end of the quadrate. This curvature depends on the development of the "proximal internal angle", which is very large in *Clidastes* and *Liodon*, and smaller in *Mosasaurus.* It is possible that the power of flexure was small in the latter genus, and that Professor Owen's conclusions in the matter may be due to imperfect material.

Under the head of matters of fact may be mentioned a few points in the history of the discovery of the structure of the *Pythonomorpha.* I have claimed in my work that the discovery of the hind limbs and much of their character has been due to Professor Marsh, and that of the anterior limbs to myself. Professor Owen writes as follows (p. 710):—"The determinations by Cuvier of certain bones and portions of bone in the original Camperian collection of remains of the Maestricht Mosasaur, as scapula, coracoid, pubis, antebrachial, carpal, and phalangeal bones, established the capital fact that it was a reptile with both scapular and pelvic arches and their appended limbs. Evidence had been obtained at the date of the Bridgewater treatises to enable Buckland to define these limbs as flippers like those of the *Plesiosaur*. The subsequent discoveries of Professors Cope and Marsh have confirmed these determinations", etc. "But the number of the digits in each limb, and of the phalanges in each digit, remain to be determined." Since Professor Marsh and myself have shown that every one of the determinations of limb-bones by Cuvier was erroneous, it is difficult to see that the credit of their discovery belongs to him. Thus, his "pubis" is an ischium; his "scapula" (fig. 9) is a coracoid; his "scapula and clavicle" is a coracoid probably of a species of *Platecarpus*; his "ulna" is an ilium; his "carpals" are ulna and phalange respectively; while his supposed phalanges, if truly such, do not belong to Pythonomorphous reptiles. If we add to this that he represents what he calls an "ungueal phalange", a structure which does not exist in the order, we are forced to the opinion that if Cuvier did discover the scapular and pelvic arches of these reptiles, he was not truly aware of it at the time. The statements of Buckland, and similar ones by Pictet, as to these limbs, are not accompanied by any references or demonstration to show that they are anything more than guesses on the subject. Nor does Professor Owen make any better exhibit in this field. In an ingeniously worded sentence (p. 683), he states that he referred fossils from New Jersey, which included "phalanges of a limb of a natatory character", to the genus *Mosasaurus*, and the inference is necessary that at that time he determined the limbs of that genus to be of natatory character. On reference to the essay cited,* I find the fact to be quite the reverse. I quote the language of Professor Leidy † in regard to it, as follows:—

"Professor Owen,‡ after remarking that no part of the organization of *Mosasaurus* is so little known as that of the locomotive extremities, and substantially quoting the views of Cuvier expressed above, enters into the description of some long bones of the extremities, 'showing the Lacertian type of structure', which were obtained in the green-sand formation of New Jersey. Professor Owen observes, 'On the highly probable supposition that these bones belong to *Mosasaurus*, they indicate the extremities of that gigantic lizard to have been organized according to the type of the existing *Lacertilia* and not of the *Enaliosauria* or *Cetacea*.'"

In reference to Professor Owen's assertion that the number of phalanges and of digits in the limbs of *Pythonomorpha* remains to be ascertained, I reply that this part of the structure of these reptiles has been made known by Professor Marsh.*

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* Quar. Journ. Geol. Soc. v. 1849, p. 380.

† Cretaceous Reptiles of North America, p. 42.

‡ British Fossil Reptiles, p. 190.

II.—HOMOLOGICAL DETERMINATIONS.

The determinations of this kind which I have made are, with two exceptions, confirmed by Professor Owen. Among them is one to which I attached some importance in the definition of the *Pythonomorpha*, viz: the identification of the opisthotic bone of that order with the suspensorium of the snakes, in opposition to the view of Huxley, that the latter bone is the squamosal.

The two exceptions are important. The one is the determination of the pterygoid bone; the other that of the roots of the teeth.

The arch which connects the solid palate with the distal portion of the *os quadratum* in the *Pythonomorpha* includes two bones, an anterior dentigerous one, and a posterior edentulous one. The posterior bone is not described by either Cuvier or Owen, and was probably unknown to them; hence, believing that the anterior bone is the posterior one, they termed it the pterygoid, and gave the name palatine to the horizontal elements immediately in front of the latter, and which I have heretofore regarded as its anterior portion. The latter (No. 20 of Professor Owen's fig. 16, Quar. Journ. Geol. Soc. 1877, p. 695) is, however, regarded by Owen as a distinct element, and he finds an oblique suture separating it from the dentigerous posterior region. On examination of the specimen of *Clidastes propython*, I find that there is a squamosal suture in the position indicated by Owen, so that it is now evident that the posterior dentigerous element is the true pterygoid, as determined by Cuvier. The posterior portion of this bone is deeply excavated, and the portion which diverges outward and backward from this point I have regarded as a distinct element. It is bounded anteriorly by a groove, which nearly resembles a suture. This groove is not continued on the inner side, so that it is either a groove for muscular insertion or a trace of a suture now obliterated. So it cannot be maintained that this posterior portion of the pterygoid is a distinct element. In this point I am corrected by Professor Owen.

As regards the teeth of the *Pythonomorpha*, I have stated that they "possess no true roots". Upon this Professor Owen responds categorically,—"The teeth of Mosasauroids have an enamelled crown and cement-clad roots." To this I must reply that my statement is in accordance with the fact and with the views of Cuvier and Leidy. The crown of the tooth in this order is supported on an osseous pedicel, which is not a true root, *i. e.*, it contains no dental tissue. By reference to Dr. Leidy's figure† and description of a section of a tooth of *Mosasaurus*, it may be learned that the dentine of the crown is not continued as a root, but terminates at a point which is in a line with the alveolar border, and does not enter the alveolus. Thus there is no "cement-clad" root, although the peduncle of the tooth is composed of a variety of bone approaching cementum. Leidy remarks,—"The fang . . . is mainly composed of vertical osseous fibres, pervaded by numerous vascular canals pursuing the same course as the former. It is of much finer texture than the bone of the jaw with which it is coössified," etc. The large vascular canals of this structure place it on the boundary between cement and bone, and its external appearance justifies the denomination bone which Leidy applies to it.

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*Amer. Journ. Sci. Arts., June, 1872, pl. x.

† Cretaceous Reptiles of North America, pl. xx, f. 3, p. 50.

Cuvier states* that in the Maestricht *Mosasaurus* the teeth in age "become filled throughout their length, and are most frequently found entirely solid. They complete their development in becoming attached to the jaw by means of an osseous body, very different in structure from that of the tooth, with which it is nevertheless intimately associated. The successional tooth originates in a special alveolus produced at the same time, and it penetrates the osseous body of the tooth in use. In enlarging, the successional tooth finally detaches the osseous body from the jaw with which it was organically united; the body by a sort of necrosis being shed and carrying with it the tooth it supported. Gradually the successional tooth, with its body, improperly called its osseous root, assumes the position from which the old one was removed."

Subsequently Cuvier,† after remarking that "he had formerly committed the error of calling the osseous structure, connecting the tooth with the jaw, the root," observes that "he had since recognized it to be the dental pulp, which, instead of remaining soft as in mammals, becomes ossified and identified with the alveolus." Cuvier continues:—"The tooth has no true root, but adheres strongly to the pulp which secreted it, and is further held in connection with it by the remains of the capsule which furnished the enamel, and which, by becoming ossified also, and uniting itself with the maxillary bone and the ossified dental pulp, inserts and fixes the tooth with additional force."

All this is well known to Professor Owen (see his Odontography); hence I conceive this position to be simply one of erroneous interpretation. *Analogically*, the teeth of these reptiles doubtless possess a root, but this part is not *homologous* with the roots of the teeth of other vertebrata; hence my statement must be accepted, that the teeth of the *Pythonomorpha* "possess no true roots".

III.—THE AFFINITIES OF THE PYTHONOMORPHA.

The summary of the relationships of this order with which I close my account of it in the second volume of the Report of the United States

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* Ossemens Fossiles, ed. 4, t. 10, p. 134.

† Ossemens Fossiles, 136.

Geological Survey of the Territories (p. 126) is stated as follows:—"As a conclusion, it may be decided that these reptiles were not nearly related to the *Varanidæ*, as has been supposed, but constitute a distinct order of the Streptostylicate group; that they are primarily related to the *Lacertilia*, secondarily to the *Ophidia*, and thirdly to the *Sauropterygia;* that they present more points of affinity to the serpents than does any other order; and that their nearest point of relationship in the *Lacertilia* is the *Varanidæ* or *Thecaglossa.*"

Professor Owen admits that the Mosasaurs are not so nearly related to the *Varanidæ* as was once supposed, as he cannot do otherwise; but he will not allow that they represent a distinct order of reptiles, but endeavors to show that they are *Lacertilia.* He especially condemns the conclusion that "they present more points of affinity to the *Ophidia* than does any other order". In doing this, he passes in review many of their characters, of which I notice sixteen, to which he attaches the chief significance. I now propose to show that the results of Professor Owen's newer examination are in accord with my own so far as they have gone, but that he fails to observe several important points of structure necessary to the question. But especially does he fail of just criticism, because he ascribes to me views which I do not hold, by frequently pointing out the Lacertilian character of certain structures, from which it is to be inferred that I have regarded them as Ophidian, when I have explicitly stated (Cretaceous Vertebrata, etc., p. 125) the reverse; and he thus exaggerates the expression of Ophidian affinity which is found in the concluding paragraph above quoted.

First character.—Professor Owen declares that in the lateral descending processes of the basioccipital the *Pythonomorpha* display Lacertilian affinity, since lizards possess them and serpents do not. I will only observe here that the same character would relate them to the *Ichthyopterygia* and turtles; and that if the median keel be evidence of ordinal affinity, then serpents must be nearly allied to the alligator, for both these reptiles possess it. But in reality the occipital segment in *Pythonomorpha* in its superior parts is more like that of *Ophidia* than *Lacertilia*, and the inferior form is not very different from that of the snakes also.

Second, the connection between the exoccipital and proötic and the suspensorium.—Professor Owen remarks (p. 687),—"*Mosasaurus* (fig. 5), shows the Lacertian extension and connection of the ex- and paroccipitals, with the expansion and abutment of the latter against the mastoid and squamosal," etc. Here is a positive error of fact, which it is difficult to understand in view of the various descriptions and figures which I have given of the parts. The "paroccipitals" (opisthotics) are *not* connate with the exoccipitals, but are large and distinct.

Third, the cranial arches.—These are wanting in *Ophidia*, but present in *Pythonomorpha* and many lizards; hence Professor Owen pronounces that these extinct forms are *Lacertilia.* He has forgotten that the large family of *Gecconidæ* among the latter possess no zygomatic nor parieto quadrate arches; that all arches are absent from the Amphisbænian and Typhlophthalm suborders, and the zygomatic arch is incomplete in the *Varanidæ*. So this character has no ordinal significance.

Fourth.—Professor Owen opposes my statement that "there is no quadratojugal arch" by the observation that "in no reptile does the jugal or malar bone join the quadrate or tympanic bone". Professor Owen has here again fallen into error, since, in *Hatteria* (*Sphenodon*) and the order *Rhynchocephalia*, the malar does, according to Günther, articulate directly with the quadrate.* I cannot now refer to Professor Owen's early description of the same genus to see whether he has himself not pointed out this structure before Dr. Günther. Professor Owen knows also that the malar is connected with the quadrate in the *Crocodilia* by the mediation of a short quadrato-jugal bone, which fact is not *directly* contradicted in the sentence above quoted from his article. My object in citing this character was to show the distinction between the *Pythonomorpha* and the orders named.

Fifth, as to the form of the quadrate bone.—Like myself, Professor Owen finds it to differ from the corresponding elements in other orders. I have, however, not cited it in evidence of Ophidian affinity, although there is no propriety in Professor Owen's remark (p. 693) that "the tympanic (quadrate) bone alone suffices to refute the Ophidian hypothesis of the Mosasauroids". Comparing it with the quadrate of specialized snakes, he naturally finds differences; but he will find near resemblances if he will examine the same element in the Tortricine and the other low or generalized snakes which Müller combined under the name of *Microstomata*.† Besides, great variations in the proportions of this and of various other elements are not inconsistent with coördinal affinity.

Sixth, as to the distinctness or coalescence of the nasal bones with surrounding parts.—Although this point is of no importance to the main question, I here observe that most of my specimens differ from the one figured and described by Professor Owen (fig. 14). He states that in the *Mosasaurus missuriensis* and *Liodon anceps*, the nasal bones are distinct; in various species of *Clidastes* and *Platecarpus*, they are coössified with other elements.

Seventh, as to the bony palate.—The partially free and dentigerous pterygoid bone is Ophidian as well as Lacertilian, but is not identical with the structure in the snakes, as I have pointed out. The supposed contact of these bones on the median line noted in *Mosasaurus missuriensis* is probably due to distortion, as it does not exist in most of the Pythonomorphous skulls which I have seen.

Eighth, as to the mandibular hinge.—I have not cited this in evidence of any special affinity, for *Pythonomorpha* might be without it, and not lose their ordinal place. But there is a much greater resemblance between this part of the structure of these animals and some of the Eryeid and Pythonid serpents than Professor Owen admits in his paper.

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* On the Anatomy of Hatteria, in Trans. Royal Society, 1867, pl. i.

† See my fig. of cranium of *Cylindrophis*, Proc. Am. Ass. Adv. Sci. xix. p. 217.

Characters of vertebræ furnish the points of the essay from the *ninth* to the *thirteenth*. As I only cite a single vertebral character in my list of those of the order, most of Professor Owen's arguments on this head are irrelevant to my conclusion. I will, however, briefly review them. But firstly as to the one to which I have attached weight,—the absence of a sacrum. Professor Owen is unfortunate in his reasoning against the use of this feature as an ordinal definition. He says:—"The absence of a sacrum does not affect the mammalian grade of the *Sirenia* or *Cetacea*, so neither does it the lacertian nature of the Mosasaurians"! Here is committed the extraordinary oversight of comparing the rank of orders in a class with the rank of the subdivisions of an order among themselves. Professor Owen should have concluded the sentence with "so neither does it the reptilian nature of the Mosasaurians"; in which case he would have been correct. The cases of the mammalian orders and that of the *Pythonomorpha* as orders of classes are indeed parallel. The absence of a sacrum is an important definition of the orders in the one case as in the other.

Of other vertebral characters I only mention two. Professor Owen cites the numerous hypapophyses of certain snakes as evidence against Ophidian affinities of Mosasauroids, but, as usual, selects those which have the largest numbers for comparison instead of those where the number is reduced. In the majority of non-venomous and Colubroid serpents, the hypapophyses are confined to the anterior part of the column, leaving the other vertebræ either smooth or not protuberant beyond the horizontal inferior line; *e. g.*, *Xenodon*, *Heterodon*. The only exception to this rule is seen in the fresh-water snakes (*Homalopsidæ*), where the hypapophyses are numerous. The character is not, however, ordinal in any case.

In discussing the other vertebral character, the structure of the atlas and axis, I am charged with the failure to recognize the homology of the odontoid process with the centrum of the atlas. There is no ground for this charge; and as Professor Owen finds no characters which distinguish these parts from the corresponding ones in Colubroid snakes, I leave it.

As the *fourteenth* point, the significance of the structure of the teeth may be considered. I have already adverted to the wide difference in the mode of support of the crowns by the jaws from that which is universal in the *Lacertilia*. Professor Owen repeats a former dictum, that this kind of attachment "is a feature of resemblance to the lacertians called acrodont". Now even the term "resemblance" can hardly be admitted; and as to homology between the two kinds of dental attachment, there is none. Says Professor Gervais, in the *Zoölogie et Paléontologie Françaises*, tome i., page 262, in describing some teeth which he refers to *Liodon*, in a note,—"C'est à tort que l'on décrit les dents des Mosasaures comme réellement acrodont à la manière de celles de beaucoup de Sauriens actuels." Professor Owen goes on to say,—"The enamel develops a pair of opposite low ridges which are minutely crenate; the crenation becomes abraded at the apical part of used teeth, but is demonstrated in unworn and unextricated crowns. Many saurians, both Crocodilian and Lacertian, show the creno-bicarinate character, but no Ophidian does." If the characters here mentioned were as universally present in the types to which Professor Owen refers as he seems to suppose them to be, they would have less significance than he attaches to them; but the variety presented by all the orders of reptiles is such as to render the above remarks quite irrelevant. Moreover, the statements are inaccurate. Teeth with two cutting edges are not uncommon in the *Ophidia* (*e. g.*, genus *Ophibolus*, the posterior maxillaries), and are far from universal among *Pythonomorpha*. The teeth of *Platecarpus* are characterized by the absence of cutting edges, having a subcircular section.* In *Clidastes*, they are not crenate.

Fifteenth.—The presence of osseous dermal scuta is cited in evidence of the Lacertilian relationship of the order. Should such scuta have existed, it would not make the *Mosasauridæ* Lacertilians, since they characterize other orders much more generally; but I am safe in saying that such structures had no existence in the known genera of *Pythonomorpha*. I have recently received large accessions of material belonging to these reptiles in admirable preservation, and have found no dermal bones. I have observed certain osseous segments arranged in lines, whose character I have not yet determined. Their form is rectangular, their tissue spongy, and their surfaces without sculpture.

Sixteenth.—The presence of the columella is rightly regarded by Professor Owen as evidence of Lacertilian relationship. But this character is not a crucial. test, since the lizards of the suborder *Rhiptoglossa* are without it, and the *Rhynchocephalia* and various turtles possess it.

IV.—CONCLUSIONS.

I now recur to the propositions which I endeavored in the work already cited† to demonstrate, and which have not been admitted by Professor Owen. They are expressed in the following language:—"That these repliles . . . constitute a distinct order of the Streptostylicate group; . . . that they present more points of affinity to the Serpents than does any other order." My conclusions that they are not nearly related to the *Varanidæ*, and that the order is nearer to the *Lacertilia* than to any other, being sustained by Professor Owen, are not further considered.

As regards the claim of the Mosasauroids to position in an order distinct from *Lacertilia*, I do not enumerate a large number of subordinate characters, in which they differ from all known *Lacertilia*, because such are not of ordinal value.* They might be wanting from *Pythonomorpha* and present in *Lacertilia* without violating their ordinal boundaries. I enumerate those which appear to be essential only. They are the following:—

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* Report U. S. Geol. Sur. Terrs. ii. p. 141.

† Report U. S. Geol. Surv. Terrs. ii. p. 126.

Subclass STREPTOSTYLICA.

Order PYTHONOMORPHA.

1. The parietal bones are decurved on the sides of the cranium, and are continuous with the alisphenoid and proötic elements.
2. The ophisthotic is largely developed, and extends upward and forward to the walls of the brain-case.
3. A distinct element connects the squamosal with the parietal bone above the opisthotic.
4. The teeth have no roots.
5. There is no sacrum.
6. There is no sternum.
7. The bones of the limbs possess no condylar articular surfaces.

Of the preceding seven characters, the decurvature of the borders of the parietal bones at the margins, and their continuity with the margins of the proötic bone, is of importance as a character not found in the *Lacertilia* and universal among *Ophidia*. Even in *Aniellidæ*† and in the *Amphisbænia*, the most snake-like of lizards, the lateral borders of the parietals are free, and are separated by a fissure from the greater portion of the proötic.‡

The opisthotic has a greater development than in lizards, where it does not reach the brain-case upward. In the serpents, its contact with the brain-case is well known. The existence of another element lying on the opisthotic, first pointed out by Marsh, is an important character. The anterior extremity of this bone enters into the side-wall of the cranium below the parietal, occupying much the position of the pterotic, and resembling, even more than the opisthotic, the suspensorium of the *Ophidia*. Should this be a true homology, the affinity to the *Ophidia* is strengthened; and should it prove to be a distinct element, not found in either *Ophidia* or *Lacertilia*, the claims of the new order to existence are maintained. In either case it is clear that the Ophidian suspensorium is not the squamosal bone.

The demonstration of my second assertion, *i. e.*, that the Pythonomorphous order presents more points of affinity to the serpents than does any other order, may be seen in the above list of characters. Professor Owen doubtless believes with me that the *Lacertilia* are more nearly allied to the *Ophidia* than is any other order, so that I only need to show that the

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*I have enumerated eleven subordinate characters on pp. 125-126 of my report, Hayden's Series, vol. ii.

† See Proc. Acad.Phila. 1864, p. 230, for the osteology of this family.

‡ Compare Professor Owen's figures of crania of *Liodon*, fig. 15, with *Monitor*, fig. 7, and *Python*, fig. 13.

Pythonomorpha are nearer to the *Ophidia* than are the *Lacertilia* to establish the truth of my position. Five of the seven characters enumerated above are so clearly of this nature that my statement is abundantly justified. And it may be true without necessarily implying close affinity with the typical serpents. Of course, the points of approximation in *Ophidia* are to those which do not present the extreme of modification of the order, but to such more generalized forms as the *Tortricidæ*, *Erycidæ*, *Scolecophidia*, etc., which are also nearest the lizards. Had Professor Owen desired a character in addition to the numerous ones which I have cited, in which they do not resemble the *Ophidia*, he might have added the absence of the trabecular grooves of the basi- and presphenoid, noticed by Huxley as distinguishing the serpents from the *Lacertilia*. But this interesting feature does not characterize the order *Ophidia*. The groove is reduced in *Xenopeltis*, and is wanting in the *Typhlopidæ*.

It only remains to show the inexact nature of the comparison which Professor Owen draws between the relations of the seals to other *Carnivora*, and those existing between the *Pythonomorpha* and *Lacertilia*. These relations he considers to be similar; that is, that as the seals are an aquatic form of *Carnivora*, so the *Pythonomorpha* are an aquatic form of *Lacertilia*. I affirm, in opposition to this view, that the relations in the two cases are totally distinct.

The seals agree with the *Carnivora* in all those important respects in which I have shown the *Pythonomorpha* to differ from the lizards. The seals possess a sternum and sacrum like other *Carnivora*; neither do they differ in the structure of the brain-case nor otic region from the same order. The teeth have dentinal roots like other *Carnivora*; and although the limbs are adapted for aquatic use, and formed superficially like those of *Pythonomorpha*, their bones are like those of *Carnivora* in all important respects. They possess the usual condylar articular faces, even to the phalanges; they have ungues also; so that all the parts common to the limbs of *Carnivora* may be found in the seals. The difference between the limbs of *Lacertilia* and *Pythonomorpha* is radical in general and in particular.

Professor Owen objects to the name which I have given to the order, and seems to think it conveys an erroneous impression. Such an impression as to my meaning appears to have been made upon my critic: what I mean to convey by it can be readily understood by reference to my definitions. The name would not be erroneous even if applied to an eel or other serpent-like animal without the least affinity to *Ophidia*, and is rather more appropriate than the names *Ichthyopterygia* for reptiles whose fins are not truly like those of fishes, or *Dinosauria*, some of which are small and weak. As to the use of the term sea-serpent, since I have not referred these reptiles to the *Ophidia*, the term involves no error. I have used the same expression in writing of the contemporary *Elasmosauri*, of totally distinct affinities. As the first name proposed for these reptiles as a natural group, with a definition, the name I have given will stand in accordance with all the rules of nomenclature.

Professor Owen has overlooked my views as to the phylogenetic position of this order, and has ascribed to me, by implication, those I do not hold. He then adds others of his own which do not commend themselves to my approval. He observes (*l. c.* 714),—"To call the Maestricht reptile a Pythonomorph is to raise a delusive beacon, misguiding the voyager in the discovery of the true course of the organic change." My views as to the course of organic change in this direction are as follows:*—"Experience has shown that generalized orders have been the predecessors of the special groups of the existing fauna. The structure of the *Pythonomorpha*, which has so much in common with orders well distinguished from each other, offers a hint of the character of the primary group from which both have sprung. That this order is not that unknown type is clear, but the indication of affinity to it is equally unmistakable." The structure of the posterior part of the skull demonstrates the correctness of this position, as it is more generalized than that of either *Lacertilia* or *Ophidia*, approximating more than either that of the tortoises. In other parts of the skeleton, this order displays the specialization which Professor Owen claims for it.

In closing this discussion of the essay of a master from whom I have learned much, and from whom I expect to learn more, I may say that I have not attempted to exhaust the subject, but have only followed it so far as to set forth my own views so as to prevent any misunderstanding of them.

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* Report U. S. Geol. Surv. Terrs. ii. p. 126.

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ART. XV.—THE GEOGRAPHICAL DISTRIBUTION OF THE MAMMALIA, CONSIDERED IN RELATION TO THE PRINCIPAL ONTOLOGICAL REGIONS OF THE EARTH, AND THE LAWS THAT GOVERN THE DISTRIBUTION OF ANIMAL LIFE.

BY JOEL ASAPH ALLEN.

I.—DISTRIBUTION OF MAMMALIAN LIFE IN THE NORTHERN HEMISPHERE, CONSIDERED IN RELATION TO LAWS OF GEOGRAPHICAL DISTRIBUTION.

When, in 1871, I published* a few preliminary remarks concerning the general subject of geographical zoölogy, it was my intention soon to present more fully the facts whereon were based the few general principles then stated. In this paper I claimed, in accordance with the views of Humboldt, Wagner, Dana, Agassiz, De Candolle, and others, that life is distributed in circumpolar zones, which conform with the climatic zones, though not always with the parallels of the geographer. Subsequent study of the subject has confirmed the convictions then expressed. These are directly antagonistic to the scheme of division of the earth's surface into the life-regions proposed by Dr. Sclater in 1857, based on the distribution of birds, and since so generally adopted. Their wide acceptation, it seems to me, has resulted simply from the fact that so few have taken the trouble to sift the facts bearing upon the subject, or to carefully examine the basis on which Dr. Sclater's divisions are founded. The recent appearance of Mr. Wallace's laborious and in many respects excellent and praiseworthy work† has now rendered a critical presentation of the subject more necessary than before, since, instead of seeking in the facts of geographical zoölogy a basis for a natural scheme of division, he has unhesitatingly accepted Dr. Sclater's ontological regions and marshalled his facts and arranged his work wholly in conformity with this, as I shall presently attempt to show, grossly misleading scheme. The source of error, as I hope to make evident, lies in method of treatment. Assuming apparently that the larger or continental land-areas are necessarily coincident with natural ontological regions, divisions of the earth's surface wholly incomparable have been contrasted, and erroneous deductions have been the result. In the division of the northern hemisphere into two primary regions, the so-called "Nearctic" and "Palæarctic", no account has been taken of the almost homogeneous character of life throughout the Arctic and Sub-Arctic regions, and the equally important principle of temperature as a powerful limiting agent, nor of the facts of the rapid increase of organic forms and the consequent differentiation of life from the Arctic regions toward the Equatorial in an ever increasing ratio in proportion to the extent and divergence of the principal land-areas. At the northward, this method of division separates, into primary life-regions, areas of the closest ontological resemblances, while at the southward these divisions each embrace faunæ so unlike those of their northern portions respectively that the two extremes of either region have little in common, scarcely more than have the southern portions of these two regions as compared with each other. It is the neglect of the above-stated fundamental facts and principles that forms the fatal weakness of the scheme of life-regions proposed by Dr. Sclater, and so widely and thoughtlessly accepted. That the facts and principles above alluded to are fundamental,—in other words, that life is distributed in circumpolar zones under the controlling influence of climate and mainly of temperature,—I propose to show by a tabular presentation of the facts of distribution of mammalian life in the northern hemisphere.

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* On the Geographical Distribution of the Birds of Eastern North America, with special reference to the Number and Circumscription of the Ornithological Faunæ. <Bull. Mus. Comp. Zoöl., vol. ii, No. 3, pp. 375–450. April, 1871.

† The Geographical Distribution of Animals. With a Study of Living and Extinct Faunas as Elucidating the Past Changes of the Earth's Surface. By Alfred Russel Wallace. Two vols. 8°. With maps and illustrations. London, 1876.

One of the reasons given by Mr. Wallace for adopting Dr. Sclater's regions is that "it is a positive, and by no means an unimportant advantage to have our named regions approximately equal in size, and with easily defined, and therefore easily remembered, boundaries", providing that "we do not violate any clear affinities or produce any glaring irregularities". It is further claimed that "all elaborate definitions of interpenetrating frontiers, as well as regions extending over three fourths of the land surface of the globe, and including places which are the antipodes of each other, would be most inconvenient, even if there were not such difference of opinion about them".*

These arguments can be scarcely characterized as otherwise than trivial, since they imply that truth, at least to a certain degree, should be regarded as secondary to convenience. They further show that the author of these propositions has not worked out in detail the distribution of life, species by species, over a diversified area of considerable extent, like, for instance, that of Eastern North America, where an interdigitation of the lesser faunal areas is one of the marked features of the region, as it is elsewhere wherever there is a varied topography and consequent inequality of climate under the same parallels of latitude. Again, Mr. Wallace says,—"On two main points every system yet proposed, or that probably can be proposed, is open to objection; they are,—1stly, *that the several regions are not of equal rank;*—2ndly, that they are not equally applicable to all classes of animals. As to the first objection, it will be found impossible to form any three or more regions, each of which differs from the rest in an equal degree or in the same manner. One will surpass all others in the possession of peculiar families; another will have many characteristic genera; while a third will be mainly distinguished by negative characters. There will also be found many intermediate districts, which possess some of the characteristics of two well-marked regions, and a few special features of their own, or perhaps with none; and it will be a difficult question to decide in all cases which region should possess the doubtful territory, or whether it should be formed into a primary region by itself."*

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* Geogr. Dist. Anim., vol. i, pp. 63, 64.

In geographical zoölogy, as in the genetic relation of animals, we find, as a rule, no strongly marked boundary-lines, and in the life-regions, especially those of lesser rank, the boundaries can be given only approximately, owing to the intergradation of contiguous faunæ and floræ, contingent upon the gradual modification of climatic conditions; yet it is not hard to find boundary-lines that shall be, if not sharply definable, at least easy of recognition. This at least proves to be the case wherever the distribution of specific forms is thoroughly known. The first objection, "that the several regions are not of equal rank," forms to my mind no objection at all, since it matters little whether they are equal or unequal if they correctly indicate the distribution of life.

The second objection Mr. Wallace has himself satisfactorily answered, in discussing the question "*Which class of animals is of most importance in determining Zoölogical Regions.*" As Mr. Wallace here points out, and as must become apparent to every careful investigator of this question, the mammalia are pre-eminently of the greatest importance in determining zoölogical regions. To summarize Mr. Wallace's argument on this point,† their dispersal is less dependent on fortuitous circumstances than that of the representatives of other classes; from their high organization they are less dependent upon "other groups of animals", and have so much power of adaptation that they are "able to exist in one form or another over the whole globe", as is certainly not the case with two of the lower classes of vertebrates, the reptilia and amphibia. Their distribution and dispersal are dependent on the distribution of the land-areas, and are modified by such physical conditions as mountain barriers, areas of forest, and grassy or desert plateaus. Furthermore, their geological history, as well as their geographical range, is better known than that of most other classes, and there is also a greater unanimity of opinion respecting their natural affinities and the limitation of families and genera in this class than in most others. "We should therefore", says Mr. Wallace (and I heartily agree with the remark), "construct our typical or standard Zoölogical Regions in the first place, from a consideration of the distribution of mammalia, only bringing to our aid the distribution of other groups to determine doubtful points. Regions so established will be *most closely in accordance with*

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* Geogr. Dist. Anim., vol. i, p. 53.

† See Geogr. Distr. Anim., vol. i, pp. 56–58.

*those long-enduring features of physical geography, on which the distribution of all forms of life fundamentally depends;** and all discrepancies in the distribution of other classes of animals must be capable of being explained, either by their exceptional means of dispersion or by special conditions affecting their perpetuation and increase in each locality." "If these considerations are well founded," he continues, "the objections of those who study insects or molluscs, for example,—that our regions are not true for their departments of nature—cannot be maintained. For they will find, that a careful consideration of the exceptional means of dispersal and conditions of existence of each group, will explain most of the divergences from the normal distribution of higher animals." †

In the present paper I shall consequently, in my discussion of the zoölogical regions of the northern hemisphere, confine myself primarily to mammals. Throwing aside, for the moment, all theoretical considerations, I shall endeavor first to present the facts of the case, and then consider what generalizations may be legitimately drawn from them.

A word, however, first in respect to the conformation and distribution of the land-areas. In reference to this part of the subject I can hardly do better than to again quote the words of Mr. Wallace, who has thus forcibly presented the subject:—"One great peculiarity of the distribution of land lies in its freedom from complete isolation . . . The continents, indeed, resembling as they do a huge creeping plant, with roots at the North Pole, and the matted stems and branches of which cover a large part of the northern hemisphere and send three great offshoots toward the South Pole, offer great facilities for the transmission of varied forms of animal life. There is evidence to prove that during the greater part of the Tertiary period the relative positions of our conti-

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* The italicizing is my own.

† The question, Which class of animals is best fitted to form the basis of a division of the earth's surface into life-regions? has a wider bearing than might be at first supposed, since the same power of adaptation to diverse climatic conditions that results in a wide distribution in some cases and a limited range in others would also impart different degrees of ability to resist the influence of geological changes, and is hence related to the question, Which class forms the best index for marking geological time? The relative importance of different groups as geological indices is necessarily connected with their power to resist unfavorable influences, and hence groups that succumb most readily would give the best clue to such changes in the past. Among vertebrates the mammalia are undoubtedly, as a *class*, the best able to survive a wide range of climatic conditions. Birds are to so great a degree migratory that they are in great measure able to avoid seasonal extremes of climate by a change of habitat. Extremes that mammals readily survive prove quickly fatal to reptiles and amphibians.

Climate, though in itself a powerful geological agent, is, of course, subject to profound modification due to geological causes. Any great amount of upheaval or subsidence of the earth's crust, or the gradual uplifting of mountain chains, must necessarily induce changes in the climate of the regions where such disturbances occur, the effect of which must extend over an area far greater than that of the disturbed district. A comparatively slight change of climate, either in respect to temperature or humidity, has a most marked influence upon vegetation, and especially upon the distribution of forests. The presence or absence of particular species of plants is well known to determine the presence or absence of many species of insects, while the distribution of whole families of the latter is determined wholly by the character of the vegetation;

nents and oceans did not greatly differ from their present form, and the former, back to the time of the Devonian formation, were never so completely submerged as to be replaced by oceans comparable in depth with our Atlantic and Pacific."* "This curious fact," he says again, "of the almost perfect continuity of all the great masses of land, notwithstanding their extremely irregular shape and distribution, is no doubt dependent on the [geological] circumstances just alluded to; that the great depth of the oceans and the slowness of the process of upheaval, has almost always produced the new lands close to, or actually connected with, pre-existing lands; and this has necessarily led to a much greater uniformity in the distribution of organic forms, than would have prevailed had the continents been more completely isolated from each other. . . . the whole land is almost continuous. It consists essentially of only three masses: the American, the Asia-African, and the Australian. The two former are only separated by thirty-six miles of shallow sea at Behring's Straits, so that it is possible to go from Cape Horn to Singapore or the Cape of Good Hope without ever being out of sight of land; and owing to the intervention of the numerous islands of the Malay Archipelago the journey might be continued under the same conditions as far as Melbourne and Hobart Town."† The close proximity of the great land-masses in the Arctic regions is a fact to be kept in mind in any discussion of the distribution of life in the northern hemisphere, and also the fact that in Tertiary times the connection was almost indisputably more intimate than it is now.

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and even mammals and birds are greatly affected, and even some are mainly controlled, in their range by the presence or absence of forests, the distribution of which is so intimately connected with climate. The reptiles, unlike mammals and birds, are quickly influenced by changes of temperature, and are unable to exist in the colder parts of the earth. Amphibians also require a moderately warm, or at least temperate, climate, and though ranging beyond the true reptiles become reduced to a few types in the cold-temperate latitudes, beyond which they wholly disappear. Fluviatile and terrestrial mollusks are also exceedingly susceptible to changes in the conditions of life that affect but slightly either insects or vertebrates, especially the two higher classes of the latter, even the geological character of a country having a powerful influence upon their distribution, as well as affecting their size and the thickness of their calcareous covering. While the mammalia are able to survive changes that would exterminate reptiles and amphibians, and are somewhat independent of the influences that govern the existence of many insects and mollusks, their fossil remains must give, for this reason, a less minute record of past geological and climatic changes than either the lower classes of vertebrates, the mollusca, or the insects, and afford a far less detailed record than plants. Among mammals sometimes the same species, and often the same genus, has a range extending from the Arctic regions to the warm-temperate or subtropical latitudes, thus showing an adaptability to varied conditions of existence not exhibited by the lower vertebrates, or by mollusks or plants. While their lack of exceptional means of dispersal and their superiority to forces of restriction that limit many groups of animals render them highly useful as a standard of reference in respect to present life-regions, the latter necessarily detracts from their importance as a medium of geological record, so far at least as regards the minuter details.

* Report of a Lecture before the Royal Geographical Society, in Geogr. Mag., vol. iv, August, 1877, p. 221.

† Geogr. Dist. Anim., vol. i, p. 37.

As is well known, and almost universally admitted, the animal and plant life of the Arctic lands is nearly everywhere the same, many of the species having a circumpolar range, while the genera are mainly, and the families almost entirely, the same throughout. Especially is this the case with mammals. To show how gradual is the change from almost absolute uniformity in the Arctic regions to the ultimate diversity met with in the intertropical latitudes it is only necessary to divide latitudinally the so-called "Nearctic" and "Palæarctic" regions into several minor areas, and to tabulate and compare the genera found in each. Adopting as our first division the region approximately bounded southward by the isotherm of 36° F., and hence embracing the Arctic, Sub-Arctic, and Cold Temperate lands of the northern hemisphere, we find that of the fifty-four commonly recognized genera of non-pelagic mammals occurring north of this boundary, five are subcosmopolitan; twenty-seven, or more than one-half, are strictly circumpolar, being represented throughout the greater part of the region north of this boundary; that five more are found on both shores of the Atlantic, and that five others are common to both shores of the Pacific. This leaves only twelve—less than one-fourth—that are peculiar to either the northern portion of North America or to the corresponding portion of the Old World, of which eight are restricted to America and four to the Europæo-Asiatic continent. These genera and their distribution are approximately shown in the subjoined table.

Genera of mammals of the Arctic and Cold Temperate portions of the northern hemisphere (the region north of the mean annual of 36° F.).

Circumpolar.			
Lynx.	Ursus.	Ovis.	Castor.
Canis.	Rosmarus.	*Vesperugo.†	*Sciurus.
Vulpes.	Phoca.	*Vespertilio.	Sciuropterus.
Mustela.	Alces.	Sorex.	Tamias.
Putorius.	Tarandus.	Arvicola.	Spermophilus.
Gulo.	Cervus.	Evotomys.	Arctomys.
*Lutra.	Bison.	Myodes.	Lagomys.
Thalassarctos.	Ovibos.	Cuniculus.	*Lepus.

American.	American and Asiatic.	Europæo-Asiatic.	American and European.
Mephitis.	Enhydris.	Meles.	Pagomys.
Taxidea.	Eumetopias.	Bos.	Pagophilus.
Procyon.	Zalophus.	Mus.	Erignathus.
Aplocerus.	Callorhinus.	Sminthus.	Halichærus.
Zapus.	Rhytina.		Cystophora.
Hesperomys.			
Fiber.			
Erethizon.			

* Subcosmopolitan. † *Scotophilus* of American authors, not of Dobson.

Summary.

Total number of genera	54
Subcosmopolitan	5
Circumpolar	27
Shores of North America and Asia	5
Shores of North America and Europe	5
Exclusively either American or Europæo-Asiatic	12
Peculiar to America	8
Peculiar to the Europæo-Asiatic continent	4

The above-given statistics show most clearly that the mammals of the northern third of the northern hemisphere present few generic or subgeneric forms that are peculiar to either North America or to the Europæo-Asiatic continent. In many cases, these are closely representative forms; in other cases, the peculiar genera extend but a short distance into the region, being temperate forms rather than hyperboreal.

The close relationship of the mammalian life of the northern lands, as compared with the diversity met with between that of the northern and southern portions of the two northern continents, is further shown by a tabulation of the genera met with in the region intervening between the cold-temperate and sub-tropical zones of life, the northern and southern boundaries of which may be considered respectively as the isotherms of 36° and 68° to 70° F. Rather more than one-half of the above-enumerated genera extend also over a large portion of this more southern belt, and impart thereby a general similarity to the *facies* of the mammalian faunæ of the two regions. In addition to these, however, we find in North America thirty-one genera and seven subgenera that are not found much, if any, to the northward of the isotherm of 36° F., and about the same proportion of new generic and subgeneric types make their appearance in the corresponding region of the Old World. Turning first to North America, we find that of these added forms one has so wide a distribution that it may be properly considered as subcosmopolitan, being found in the corresponding region of the Europæo-Asiatic continent as well as far to the southward of the region under notice. One other occurs also in Eastern Asia and six more belong rather to Tropical America than to Temperate North America. Excluding these, leaves about thirty as strictly American and twenty-two that are almost wholly restricted to Temperate North America; there is, hence, twice as great a difference between the mammalian faunæ of the middle temperate region of North America and the colder portion of the same continent as there is between those of the colder parts of the two northern continents, or the northern portions of the so-called "Nearctic" and "Palæarctic Regions". But we get in Temperate North America not only twenty-two generic and subgeneric forms peculiar to this region, but a differentiation of this region into three well-marked faunal areas, differing more from each other than do the boreal parts of the New World ("Nearctic Region") from the boreal parts of the Old World ("Palæarctic Region"). While thirteen of the genera, or about one-third, have a general distribution throughout Temperate North America, there are four genera and one subgenus peculiar to the so-called Eastern Province, five genera and one subgenus mainly restricted to the Middle Province, and five genera and two subgenera almost wholly limited to the geographically much smaller Western Province. In addition to this, there are five other genera and one subgenus common to the greater part of the Middle and Western Provinces that are not found in the Eastern.* The genera that may be regarded as characterizing the middle temperate region of North America and their relative distribution is shown in the subjoined table.

Terrestrial genera and subgenera of Middle North America (between the mean annuals of 36° and 68° F.), not found in the Arctic and Cold Temperate latitudes.

[NOTE.—Subgenera are enclosed in parentheses]

Of general distribution.		Limited to the Eastern Province.	Limited to the Middle Province.	Limited to the Western Province.	Common to the Middle and Western Provinces.
Felis.	*Sigmodon.	Nycticejus.	*Bassaris.	*Macrotus.	(Otospermophilus.)
Urocyon.	Ochetodon.	*Synotus.	Antilocapra.	Antrozous.	(Pedomys.)
Cariacus.	(Pitymys.)	Condylura.	*Dicotyles.	*Nyctinomus.,	Perognathus.
Lasiurus.	Geomys.	Blarina.	*(Notiosorex.)	† Urotrichus.	Cricetodipus.
Scapanus.	Didelphys.	(Oryzomys.)	Synaptomys.	(Onychomys.)	Dipodomys.
Scalops.			Cynomys.	(Chilotus.)	Thomomys.
Neosorex.				Haplodon.	
Neotoma.					

* Chiefly tropical. † Occurs also in Asia.

Summary.

Total number of genera (plus 7 subgenera)	38
Of general distribution	13
Peculiar to the Eastern Province	5
Peculiar to the Middle Province	6
Peculiar to the Western Province	7
Common to the Western and Middle Provinces, but not found in the Eastern	6
Mainly tropical or subtropical	8

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* Mr. Wallace, in his late work (Geogr. Dist. Anim., vol. i, p. 6), refers to the Rocky Mountains as forming a barrier to species, "almost all the mammals, birds, and insects" belonging to different species on the two sides of the Rocky Mountains. Nothing, so far as mammals and birds are concerned (and I am informed by good authorities that the same is true of insects), could well be further from the truth. Only in rare instances do the Rocky Mountains form such a barrier, the division between the Eastern and Middle Provinces being more than six hundred miles to the eastward of this range, while the boundary between the Middle and Western Provinces is formed by the Sierra Nevada chain. The same species, as a rule, range over the greater part of the great elevated interior plateau, of which the Rocky Mountains constitute the axis. So far as the distribution of both birds and mammals is concerned, the presence or absence of forests, and the accompanying diverse climatic conditions, have far more to do with the limitation of habitat than the commonly so-called "Rocky Mountain barrier". This is obviously due to the longitudinal direction of this supposed barrier, which, if trending in a latitudinal direction, would certainly form an impassable obstacle to very many species.

Between the warm-temperate belt we have been considering and the zone next to the southward—the subtropical—the faunal differences are far greater than between the warm-temperate and colder zones. Aside from the few subcosmopolitan genera still present, and the few essentially tropical genera that range northward into the warmer temperate zone, there is little in common to the mammalian faunæ of these two regions. At or near this boundary (the isotherm of about 68° F.—say 68° to 70° F.) several strictly tropical families first make their appearance, and tropical genera begin largely to replace those of the colder region to the northward.

In respect to the Europæo-Asiatic continent, we have already seen how small a proportion of the genera of mammals met with north of the thirty-sixth isotherm are really peculiar to this region, the number being less than twelve per cent., the remainder being circumpolar. Passing, however, to the warm-temperate division of this Europæo-Asiatic continent, or that portion between the isotherms of 36° and 68° to 70° F., and we meet with many genera not found to the northward. While many circumpolar genera still prevail, at least three-fourths of the whole number are here first met with. A considerable proportion (about one-fifth) are properly southern or subtropical, and extend far to the southward of the warm-temperate zone. About one-half, however, are peculiar to this zone, and belong to groups (families of subfamilies) especially characteristic of the North Temperate Realm. In adopting the isotherm of 70° F. as its southern boundary, we include not only the Mediterranean Province (and hence Northern Africa), but all of Asia north of the great Himalayan chain, together with Northern China and the Persian Peninsula. Hence quite a number of such southern forms occur as *Macacus*, *Herpestes*, *Genetta*, *Hyæna*, *Hystrix*, etc., that are more properly members of the intertropical fauna. Owing to the great extent of this region, we meet with many genera peculiar to special districts, giving a higher proportion of peculiar forms than is met with in the corresponding portion (but far more limited in area) of North America. Of about fifty genera met with here that do not occur to the northward, about one-fourth may be thrown out as more properly tropical, since they in most cases barely enter the southern border.

Of the remainder, fully one-half are restricted in their range wholly or almost wholly to this region, the rest extending far into or throughout the Old World tropics. There is thus more than thrice as great a difference between the mammalian fauna of the boreal parts of the Europæo-Asiatic continent and that of the warmer parts of the same continent as between the fauna of the boreal parts of the Europæo-Asiatic continent and the corresponding region of North America. The differentiation is here again, as in North America, from the north southward, not through the rapid increase of land-area and diversity of physical structure, but purely from climatic conditions,—through the multiplication of life in consequence of increase of temperature and means of subsistence. This is still more strikingly shown by a comparison of the fauna of the middle portion of the so-called "Palæarctic Region" with that of its southern border, at which point the truly tropical forms begin to appear. The genera of a zone, say two degrees in width, at these two points would be not only in large part different, but those of the southern belt would be far more numerous.

Genera of mammals of the warm-temperate portions of the eastern hemisphere (between the isotherms of 36° *and* 68° *to* 70° *F.), not occurring to the northward of the* 36*th isotherm.*

[*] Macacus.
Felis.
[*] Genetta.
[*] Herpestes.
[*] Hyæna.
[†] *Nyctereutes.*
[†] *Lutronectes.*
[†] *Ælurus.*
[*] Equus.
[†] Camelus.
[†] *Dama.*
[†] *Elaphodus.*
[†] *Lophotragus.*
[†] *Moschus.*
[†] *Hydropotes.*
[†] *Poëphagus.*
[*] *Addax.*
[*] Oryx.
Damalis.
[†] *Procapra.*
[†] *Saiga.*
[†] *Pantholops.*
[†] *Budorcas.*
[†] *Rupicapra.*
Nemorhædus.
Capra.
Rhinolophus.
[*] Plecotus.
[*] Synotus.
Scotophilus.
Miniopterus.
[*] Nyctinomus.
[†] *Scaptochirus.*
[†] *Scaptonyx.*
[†] *Anusorex.*
[†] *Mygale.*
Urotrichus.
[†] *Uropsilus.*
Crocidura.
[†] *Nectogale.*
Spalax.
Rhizomys.
[†] *Siphneus.*
Meriones.
[†] *Cricetulus.*
[†] *Alactaga.*
[*] Gerbillus.
[*] Dipus.
Muscardinus.
Eliomys.
[*] Hystrix.

Summary.

Total number	51
Occurring in southern portions only	13
Peculiar to the region, and generally restricted to a limited range	24
Of rather wide range southward	14

A comparison of the families represented in different portions of the northern hemisphere north of the isotherm of 70° F. brings into prominence some of the points already stated, without the confusion of detail incident to a comparison on the basis of genera, and gives also a more convenient standard for the next stage of comparison, namely, a comparison of the faunæ of the temperate zones with those of the tropical, as well as with the faunæ of the two great land-areas of the northern hemisphere. Of thirty-three families of non-pelagic mammals found north of about the isotherm of 70° F. (68° to 70°), thirteen have a nearly cosmopolitan distribution, and six others are common to both the Old World and the New, leaving fourteen, or about one-third, peculiar to either North America or to Europe and Asia. Three of these are essentially subtropicopolitan or tropicopolitan, having merely straggling representatives north of the 68th isotherm, and five others are represented each by only a single species. Seven of these fourteen families (four only according to many systematists[‡]) are North American and seven European and Asiatic. One or two others barely touch, or possibly overlap slightly, the above-given boundary. North of the isotherm of 36° F. not more than two or three families are met with that are not cosmopolitan, and two of these have each but a single species north of this line.

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[*] Occurring in southern portions only; chiefly tropical.

[†] Peculiar to the region and mostly of restricted range.

[‡] I here admit to family rank *Antilocapridæ*, *Zapodidæ*, and *Geomyidæ*, the two former of which are treated by Mr. Wallace as subfamilies of subcosmopolitan families, while the other is not commonly recognized as distinct from *Saccomyidæ*. On the other hand, I refer the *Cercolabidæ* to the *Hystricidæ*.

The following is a list of the families referred to above, with approximate indications of their distribution.

Families of non-pelagic mammals occurring north of the mean annual of 70° F.

Subcosmopolitan.		Circumpolar.	North American.	Europæo-Asiatic.
Felidæ.	Bovidæ.	Rosmaridæ.	† Procyonidæ.	Erinaceidæ.
Canidæ.	Vespertilionidæ.	* Rhytinidæ.	‡ Antilocapridæ.	‡ Suidæ.
Mustelidæ.	Muridæ.	Talpidæ.	‡ Zapodidæ.	Equidæ.
Ursidæ.	Sciuridæ.	Soricidæ.	Geomyidæ.	Myoxidæ.
Otariidæ.	Hystricidæ.	Castoridæ.	Saccomyidæ.	Spalacidæ.
Phocidæ.	Leporidæ.	Lagomyidæ.	‡ Haplodontidæ.	Dipodidæ.
Cervidæ.			† Didelphyidæ.	Rhinolophidæ.

* Formerly occurring on the shores of the North Pacific only, but now extinct.
† Tropical; one species only found north of 70th isotherm. ‡ Represented by a single species.

Summary.

Whole number	33
Subcosmopolitan	13
Circumpolar (arctopolitan)	6
American (exclusively)*	7
Europæo-Asiatic (or exclusively Old World) †	7

In regard to the southern extension of these thirty-three families, thirteen range far into, and most of them over, the greater part of Intertropical America, and eighteen far into, and most of them over, the greater part of the intertropical portion of the Old World.

In Intertropical America, only thirty families are represented. Of these, thirteen occur over much of Temperate North America, while eleven are subcosmopolitan, and the same number are peculiar to the region, while one-half of the whole do not range much beyond the northern tropic. Seven are semitropicopolitan, or occur also in the warmer parts of the Old World; but of these, three are *Chiroptera* and another is marine. The approximate range of the families represented in Intertropical America is indicated in the annexed table.

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* Five only are exclusively North American.
† Two only are exclusively "Palæarctic".

Families of non-pelagic mammals occurring in Intertropical America (between the northern and southern isotherms of 70° F.).

[NOTE.—The names of families peculiar to the region are printed in italics.]

Cebidæ.
Mididæ.
Felidæ.
Canidæ.
Mustelidæ.
† Procyonidæ.
Bassarididæ.
Cercoleptidæ.
Otariidæ.
Cervidæ.
* Trichechidæ.‡
* Tapiridæ.
Dicotylidæ.
Phyllostomidæ.
Emballonuridæ.
Vespertilionidæ.
Soricidæ.
* Centetidæ.
Sciuridæ.
Muridæ.
* Octodontidæ.
Dinomyidæ.
Caviidæ.
Dasyproctidæ.
Hystricidæ.
Leporidæ.
Brachypodidæ.
Dasypodidæ.
Myrmecophagidæ.
† *Didelphyidæ.*

Summary.

Total number	30
Peculiar to the region	12
Not found in temperate parts of North America	16
Subcosmopolitan	11
Occurring in the warmer parts (only) of the Old World	5
Occurring in North America (at large)	13

Fifty families are represented in the intertropical portions of Asia and Africa. Of these nearly thirty do not range much beyond the Northern Tropic, of which about twenty-three are limited to this region. Of the thirty-two families occurring in the north-temperate zone (of which only six[*] or seven are exclusively Europæo-Asiatic), nearly one-half range over most of the Indo-African tropics. The following is a list of the families represented in the Old World tropics, exclusive of those limited to Madagascar and the Australian Realm.

Families of non-pelagic mammals occurring in the Indo-African Tropics (between the northern and southern isotherms of 70° F.)

[NOTE.—The names of families not occurring northward of the region are printed in italics.]

Simiidæ.
Cynopithecidæ.
Lemuridæ.
Tarsiidæ.
Felidæ.
Protelidæ.
Hyænidæ.
Viverridæ.
Canidæ.
Mustelidæ.
Ursidæ.
Æluridæ.
Camelidæ.
Giraffidæ.
Bovidæ.
Cervidæ.
Tragulidæ.
Hippopotamidæ.
Phacochœridæ.
Suidæ.
Equidæ.
Rhinocerotidæ.
§ *Tapiridæ.*
Hyracidæ.
Elephantidæ.
Halicoridæ.
§ *Trichechidæ.*
Pteropidæ.
Rhinolophidæ.
Nycteridæ.
Vespertilionidæ.
§ *Emballonuridæ.*
Galeopithecidæ.
Talpidæ.
Soricidæ.
Erinaceidæ.
Potamogalidæ.
Macroscelidæ.
Tupayidæ.
Lophiomyidæ.
Dipodidæ.
Muridæ.
Myoxidæ.
Sciuridæ.
Anomaluridæ.
Hystricidæ.
§ *Octodontidæ.*
Leporidæ.
Manididæ.
Orycteropodidæ.

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* Occurring in the Old World Tropics.
† Occurring also in Extratropical America.
‡ *Manatidæ* of most authors.
§ Also represented in Intertropical America

Summary.

Total number	50
Peculiar (or almost wholly restricted) to the region	22
Subcosmopolitan	13
Represented in the American tropics (only)	4
Occurring in the Old World north of the tropics	23
Tropical	29

It thus appears that only about three-fifths as many families of mammals occur in the intertropical parts of the New World as in the corresponding parts of the Old World. The disproportion in the same direction in respect to genera and species is still greater. This is obviously due to the difference in size and configuration of the two areas. The Old World intertropical land-surface is not only several times greater than the American (embracing thrice as great a breadth longitudinally), but is differentiated into one continental (Africa), two large peninsular (India and China) areas, and a group of large, highly differentiated islands (Malay Archipelago), while the intertropical region of America forms a single unindented region, with a single narrow isthmic prolongation. In the one case (America) we have a striking uniformity of mammalian life throughout, corresponding with the general uniformity of the climatic conditions characteristic of this area, contrasting with well-marked subdivisions in the other, and a much greater diversity of environing circumstances, originating geologically far back in the history of these several land-masses. As Mr. Wallace has remarked,—"To those who accept the theory of development as worked out by Mr. Darwin, and the views as to the general permanence and immense antiquity of the great continents and oceans so ably developed by Sir Charles Lyell, it ceases to be a matter of surprise that the tropics of Africa, Asia, and America should differ in their productions, but rather that they should have anything in common. Their similarity, not their diversity, is the fact that most frequently puzzles us."*

In the foregoing remarks, no reference has been made to Madagascar or to Australia, for the reason that they belong to distinct primary life-regions having little in common with the great Europæo-Asiatic land-area (of which Africa, on the other hand, is an inseparable appendage), which, with America, form the regions to which the discussion has thus far been intentionally limited. As will be more fully considered later, the intertropical Old World area is divisible into secondary regions, which for the present need not enter into the questions immediately at issue. These are, first, Does that portion of the northern hemisphere north of the northern subtropical zone admit of division into two primary life-regions, conforming in their boundaries to the configuration of the two great northern land-areas? And, secondly, In accordance with what principle does the life of the northern hemisphere become differentiated from the homogeneity characteristic of the northern regions to the great diversity met with under tropical latitudes? The fundamental question which underlies the whole subject is, Is, or is not, the life of the globe distributed in circumpolar zones? The second is, How and under what influences does it become differentiated?

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* Geogr. Dist. Anim., vol. i, p. 51.

To the first of these questions, I ventured some six years since,* to give an affirmative answer, in accordance not only with the views of numerous high authorities on the subject of the geographical distribution of life, but with what seemed to me to be incontrovertibly the facts in the case. While this view has since received the support of other high authorities, it has been altogether ignored by the advocates of Dr. Sclater's division of the earth's surface. Mr. Wallace, who faithfully reflects the views of the Sclaterian school, in referring to this subject says:—"Mr. Allen's system of 'realms' founded on climatic zones . . . calls for a few remarks. The author continually refers to the '*law of the distribution of life in circumpolar zones*', as if it were one generally accepted and that admits of no dispute. But this supposed 'law' only applies to the smallest details of distribution—to the range and increasing or decreasing numbers of *species* as we pass from north to south, or the reverse; while it has little bearing on the great features of zoölogical geography—the limitation of groups of *genera* and *families* to certain areas. It is analogous to the '*law of adaptation*' in the organization of animals, by which members of various groups are suited for an aerial, an aquatic, a desert, or an arboreal life; are herbivorous, carnivorous, or insectivorous; are fitted to live underground, or in fresh waters, or on polar ice. It was once thought that these adaptive peculiarities were suitable foundations for a classification,—that whales were fishes, and bats birds; and even to this day there are naturalists who cannot recognize the essential diversity of structure in such groups as swifts and swallows, sun-birds and humming-birds, under the superficial disguise caused by adaptation to a similar mode of life. The application of Mr. Allen's principle leads to equally erroneous results, as may be well seen by considering his separation of 'the southern third of Australia' to unite it with New Zealand as one of his secondary zoölogical divisions."†

Leaving Mr. Wallace's last-quoted objection for notice in another connection (see a foot-note beyond, under the sub-heading "Australian Realm"), I unblushingly claim, in answer to the main point, that the geographical distribution of life is *by necessity* in accordance with *a "law of adaptation"*, namely, of *climatic adaptation;* that such a law is legitimate in this connection, and that the reference to the "superficial disguise" adapting essentially widely different organisms to similar modes of life is wholly irrelevant to the point at issue,—a comparison of things that are in any true sense incomparable; furthermore, that the "law of distribution of life in circumpolar zones" does apply as well in a general sense as to details—"to groups of genera and families" as well as to species. In the foregoing remarks I have had little to say respecting the range of *species*, and have tabulated merely genera and families. These tables clearly show that a large proportion of the mammalian genera and families of the northern hemisphere have a circumpolar range, the same genera and families occupying the Arctic and Sub-Arctic lands in both the Old World and the New, and that only a small per cent. of the whole number found here are peculiar to either of the northern land-areas; that a large part of the genera and families met with in the temperate and warmer latitudes occur on the eastern continent as well as on the western; that again a considerable proportion of the genera and families met with in the warmer parts of the earth occur also both in the Old World and the New, while many others are well known to have been common to the two during the Tertiary period. It has been further shown that there is a greater diversity of life between contiguous climatic belts of the same continent than between corresponding belts of the two continents, especially north of the forty-fifth parallel of latitude, and that any marked faunal differentiation of the two continents begins only in the warm-temperate and subtropical latitudes. On each continent, the arctic, temperate, and tropical zones are each marked in their general *facies* respectively by corresponding phases of life. So obvious is this that we have in current use the expressions "arctic life", "temperate life", and "tropical life", in recognition of certain common features of resemblance by which each of these regions is distinguished as a region from the others. This is in accordance with a law I have termed the law "of differentiation from the north southward",* or in accordance with increase of temperature and the conditions resulting therefrom favorable to increased abundance of life.

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* Bull. Mus. Comp. Zoöl., vol. ii, p. 376, 1871.

† Geogr. Dist. Anim., vol. i, p. 67.

In this connection it may be well to recall certain general facts previously referred to respecting the geographical relations of the lands of the northern hemisphere and their past history. Of first importance is their present close connection about the northern pole and their former still closer union at a comparatively recent date in their geological history; furthermore, that at this time of former, more intimate relationship, the climatic conditions of the globe were far more uniform than at present, a mild or warm-temperate climate prevailing where now are regions of perpetual ice, and that many groups of animals whose existing representatives are found now only in tropical or semitropical regions lived formerly along our present Arctic coasts. We have, hence, an easy explanation of the present distribution of such groups as Tapirs, Manatees, many genera of Bats, etc., in the tropics of the two hemispheres, on the wholly tenable assumption of a southward migration from a common wide-spread northern habitat, to say nothing of the numerous existing arctopolitan and semi-cosmopolitan genera. The former greater community of life in the northern hemisphere in preglacial times is further evinced by the wide-spread occurrence there of the remains of Camels,

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* Bull. Mus. Comp. Zoöl., vol. ii, p. 379.

Elephants, Mastodons, Rhinoceroses, and Horses, which, though extinct in America, have living representatives in the tropics of the so-called "Old World", to say nothing of the evidence afforded by the remains of still earlier types of arctopolitan range. The succeeding epochs of cold caused extensive migrations of some groups and the extinction of others; with the diverse climatic conditions subsequently characterizing high and low latitudes came the more pronounced differentiation of faunæ, and the development, doubtless, of many new types adapted to the changed conditions of life—the development of boreal types from a warm-temperate or semi-tropical stock. The accepted theories respecting the modification of type with change in conditions of environment—changes necessarily due mainly to climatic influences—render it certain that if animals are so far under the control of circumstances dependent upon climate, and emphatically upon temperature, as to be either exterminated or greatly modified by them, the same influences must govern their geographical distribution.

Recent discoveries respecting the mammalia inhabiting North America during the Tertiary period have shown that many of the leading types of mammals—including not only those above named, but also many others—now found only in the eastern hemisphere, originated in North America, and migrated thence to Asia, Europe, and even Africa, either as somewhat generalized types, or after they had nearly reached their present degree of differentiation; in short, so far as mammalian life is concerned, that America is *the* "Old World" from which the so-called "Old World" has been mainly peopled. The present genetic convergence of life about the northern pole seems to show that not only has there been here a comparatively free intercommunication, but that the mammalian life now existing there has lived there for a long period under similar conditions of environment; and that these conditions are unfavorable, in consequence of a comparatively low temperature, to rapid change of form or structure.

This is shown not only by the great diversity of life met with in the intertropical regions, as compared with the uniformity met with in the semi-frigid regions (equal areas being, of course, compared), but by the coincident occurrence of a simple, homogeneous arctic marine fauna, with the low temperature over the sea-floor far to the southward of where such forms occur in the warmer surface and shore-waters. The intimate relation between temperature and the distribution of life is most forcibly shown by the existence under the same parallel of latitude of diverse faunæ not only at different elevations above the sea on mountain-slopes, but at different depths beneath the surface of the ocean, where the several faunæ are characterized not only by the presence of different species, but by the prevalence of different genera, and even families. In fact, it is to me a matter of surprise that, with our present knowledge of the subject, any naturalist of note should assume that temperature has nothing to do with the circumscription of faunæ, or that any law based on it can have "little bearing on the great features of zoölogical geography—the limitation of groups of genera and families to certain areas".

II.—MAMMALIAN REGIONS OF THE GLOBE.

The influence of temperature as a limiting agent in the distribution of life, as well the "*law* of the distribution of life in *circumpolar zones*", was fully recognized by Humboldt nearly three-fourths of a century ago, and later, practically if not explicitly, by Ritter, De Candolle, Agassiz, Wagner, Forbes, Dana, Günther, Meyen, Middendorff, and many other leading zoölogists and botanists. While this law must incontrovertibly underlie every philosophic scheme of lief-regions, the number of zones to be recognized, as well as their boundaries, must in a measure be open to diversity of opinion. Professor Dana, in 1852, recognized five primary zones for marine animals, namely, a torrid, a north and a south temperate, and a north and a south frigid. The torrid and temperate were subdivided, the first into three, the others each into five sub-zones, the two frigid being left undivided. Mr. A. Agassiz, in treating of the distribution of the *Echini*,* recognizes also five zones, a torrid, two temperate, and two frigid. These five primary zones prove to be applicable also to the mammalia, and even their subdivisions may be readily traced, but are rather too detailed for practical use. Owing to the irregular surface of the land-areas, occasioned by elevated plateaus and mountain-chains, these zones of distribution have of course a less regular breadth and trend than they preserve over the oceans. Their boundaries, however, approximate to the courses of the isotherms, by certain of which they may be considered as in a general way limited.

In recognition of these zones, and also of the law of differentiation of life with the relative isolation of the principal land-areas, I proposed in a former paper (*l. c.*, p. 380) a division of the land-areas into eight "Realms", namely: I, Arctic; II, North Temperate; III, American Tropical; IV, Indo-African; V, South American Temperate; VI, African Temperate; VII, Antarctic; VIII, Australian. A subdivision of most of these primary regions was provisionally suggested, but only the North American was treated with any degree of detail, and this mainly with reference to the birds, and more especially those of its eastern portion. Subsequent study of the distribution of mammalian life over the globe has led me to modify some of the views then expressed, especially in relation to the divisions of the Australian Realm, and to unite the South African Temperate with the Indo-African, as a division of the latter, and also to recognize Madagascar and the Mascarene Islands as forming together an independent primary region, in accordance with the views of Sclater, Wallace, and others. Whether or not the Arctic and Antarctic Regions should stand as primary divisions seems also open to question. While perhaps tenable on general grounds, they are hardly required for the elucidation of the distribution of the mammalia, since they must be mainly characterized negatively.

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* Illustr. Cat. Mus. Comp. Zoöl., No. vii, 1872, pls. A–F.

Beginning with the Arctic Region, we meet, as already shown, and as is almost universally admitted, a continuous homogeneous fauna, of considerable geographical area, but mainly characterized by what it lacks. Its southern boundary may be considered as the northern limit of forest vegetation. Continuing southward, few other than arctopolitan genera of mammals are met with north of the mean annual of 36° F. This considerable belt hence includes what may be termed the cold-temperate zone. The American and Europæo-Asiatic portions of this zone are only to a slight degree differentiated, while each is essentially homogeneous.

Below this, non-arctopolitan genera, or those restricted to more or less limited areas, become more frequent, and, indeed, form a considerable proportion of the genera represented. This belt occupies the remainder of the north-temperate zone, extending to about the mean isotherm of 70° F., and may be termed the warm-temperate zone. Unlike the cold-temperate zone, it is divisible on each continent into several well-marked minor regions, which are, however, more strongly differentiated, *inter se*, in the Old World than in the New.

The tropical zone embraces, of course, in its fullest extension, a much greater latitudinal breadth than the temperate, but its southern land-border is very irregular, its only considerable development south of the equator being in South America and Africa. It is also so much diversified in many parts by mountain-chains that subdivision into secondary zones seems less feasible than in the case with the north-temperate zone. A central torrid and a north and a south sub-torrid zones might, however, be readily made, but such a division has not been attempted in the present connection. A northern sub-torrid division may indeed be very conveniently recognized, extending from about the annual isotherm of 67° to that of about 74° F., and including a transitional region consisting of the extreme southern border of what has been above defined as the warm-temperate zone and the northern border of the tropical.

In like manner, the distribution of life seems to warrant the recognition, in Africa and South America, of a corresponding transitional belt between the two torrid and the southern warm-temperate zones. Aside from these divisions, the Torrid Zone admits of others of a more practical or useful character. These become at once obvious, since they result from the position and configuration of its component land elements. The first is a primary separation into two "realms", an American and an Indo-African. Each of these is again divisible into several minor portions or "provinces"; but the Indo-African admits also of division into two "regions", an African and an Indian, which are divisions of secondary rank, each having several "provinces".

The South Temperate Zone has a very limited land-surface, consisting of the southern third of South America, a small portion of Southern Africa, and the greater portion of Australia. Extra-tropical South Africa is all comprised within the Warm Temperate Zone, and is so small in area and so intimately related, both geographically and faunally, with Tropical Africa, that its formal separation, while, perhaps, warranted in the abstract, is hardly practically necessary. Temperate South America is exceedingly irregular in its northern outline, owing to peculiarities of configuration, resulting from the presence of the great Andean Plateau, by means of which it extends along the western border of South America far northward of the southern tropic. Temperate Australia is clearly separable from the tropical portion of the Australian Realm. The South Temperate Zone hence consists of three comparatively small land-areas, widely separated from each other, and consequently, as would be supposed, have little in common.

The Antarctic Region has a very limited amount of land-surface, and the few species that compose its fauna are almost wholly either marine or pelagic. As previously stated, as a mammalian region it has little significance.

This hasty sketch shows that the differentiation of the land-surface of the earth into realms, regions, and minor divisions has relation not only to climate, but to the divergence and isolation of the different principal land-areas; that at the northward, where the lands converge, there is no partitioning in conformity with continental areas, the temperate and colder portions of the northern hemisphere all falling into a single primary division, and that only the southern half is susceptible of divisions of the second rank. Within the tropics, on the other hand, the lands of the eastern and western hemispheres fall at once into different primary regions, and one of these is again divisible into regions of second rank. Beyond the tropics, the land-surfaces are of small extent, widely separated, and faunally have almost nothing in common.

With these preliminary remarks, we may now pass to a detailed consideration of the several primary regions and their subdivisions.

I.—ARCTIC REALM.

Whether or not an Arctic Region should be recognized as a division of the first rank is a question not easy to satisfactorily answer. Naturalists who have made the distribution of animal life in the boreal regions a subject of special study very generally agree in the recognition of a hyperboreal or circumpolar fauna, extending in some cases far southward over the Temperate Zone. The Arctic portion of this hyperborean region has been frequently set off as a secondary division, or subregion,* and generally recognized as possessing many features not shared by the contiguous region to the southward. For the present I prefer to still retain it as a division of the first rank. It is characterized mainly by the paucity of its life, as compared with every region except the Antarctic, and by what it has not rather than by the possession of peculiar species or groups. It wholly lacks both Amphibian and Reptilian life, is almost exclusively the summer home of many birds, and forms the habitat of the Esquimaux, the Arctic Fox, the Polar Bear, the Musk Ox, the Polar Hare, the Lemmings, the Walruses, the Narwhal, and the White Whale, which are confined within it. It has no *Chiroptera* nor *Insectivora*, two or three species of Shrews, however, barely reaching its southern border. It shares with the cold-temperate belt the presence of the Moose and the Reindeer, several Pinnipeds, a number of boreal species of *Glires*, several fur-bearing *Carnivora*, and a considerable number of birds. Its southern boundary may be considered as coinciding very nearly with the northern limit of arboreal vegetation, and hence approximately with the isotherm of 32° F. Its more characteristic terrestrial forms range throughout its extent, none being restricted to either the North American or Europæo-Asiatic continent. Hence it is indivisible into regions of the second and third grades (regions and provinces), and may be considered as embracing a single hyperborean assemblage of life.

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* It forms Mr. Blyth's "Arctic Subregion" (Nature, vol. iii, p. 427, March 30, 1871), Mr. Brown's "Circumpolar" division (Proc. Zool. Soc., Lond., 1868, p. 337), and Dr. von Middendorff's "Zirkumpolar-Fauna" (Sibirische Reise, Bd. iv, p. 910, 1867). It also accords very nearly with Agassiz's "Arctic Realm" (Nott and Gliddon's Types of Mankind, 1854, p. lx and map).

II.—NORTH-TEMPERATE REALM.

Very few writers on zoölogical geography have failed to recognize the striking resemblance the fauna of Temperate North America bears to that of the corresponding portion of the Old World. The resemblance is less in the Avian class than among mammals, but is generally acknowledged as obtaining even there. Dr. Sclater, while admitting a strong resemblance between these areas, considered them as separable into two primary regions, in which view of the case he has been followed, among prominent writers on the subject, by Dr. Günther, Mr. Wallace, Mr. Murray, and Professor Cope. Dr. Günther, while provisionally accepting Dr. Sclater's "Nearctic" and "Palæarctic" regions, refers pointedly to the disagreement of the distribution of Batrachians with these divisions; for in discussing the distribution of this class he says,—"Dissimilarity and similarity of the Batracho-fauna depend upon zones. Palæarctic and Nearctic regions resemble each other more than any other third; the same is the case with Australia and South America; the Ethiopian region exhibits similarity with South America, as well as with the East Indies, but more especially with the latter."* Mr. Murray admits that "the boreal extremity of North America is tinged with a Europeo-Asiatic admixture", which he regards as "an extraneous element grafted upon the genuine stock, and easily eliminated from it".† But in his map of "Great Mammalian Regions" the boreal parts of both continents are similarly colored, the same color, however, extending only to about the forty-ninth degree of north latitude in North America, while in Africa it descends to north latitude 18°, and in Asia ranges from north latitude 30° to 25°! His divisions as recognized in the text are still more arbitrary and unphilosophic.

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* Proc. Zoöl. Soc. Lond., 1858, p. 390.

† Geogr. Dist. Mam., p. 312.

Mr. Wallace, in his discussion of zoölogical regions, says,—"The distinction between the characteristic forms of life in tropical and cold countries is, on the whole, very strongly marked in the northern hemisphere; and to refuse to recognize this in a subdivision of the earth which is established for the very purpose of expressing such contrasts more clearly and concisely than by ordinary geographical terminology, would be both illogical and inconvenient. The one question then remains, whether the Nearctic region should be kept separate or whether it should form part of the Palæarctic or of the Neotropical. Professor Huxley and Mr. Blyth advocate the former course; Mr. Andrew Murray (for mammalia) and Professor Newton (for birds) think the latter would be more natural. No doubt," Mr. Wallace adds, "much is to be said for both views," but decides in favor of the separation of the two regions in accordance with Dr. Sclater's scheme.*

While Mr. Blyth includes North America in his "Boreal Region" (as "2. Neo-septentrional Sub-region"), he adds also Central America and the Antilles (as "3. Neo-meridional Sub-region"), and, still more strangely, the Andean Region, with Chili, Patagonia, and the Fuegian and Falkland Archipelagos (as "4. Andesian Sub-region").†

Professor Huxley, in writing of the primary ontological regions of the globe, thus observes:—"In a well-known and very valuable essay on the Geographical Distribution of Birds, Dr. Sclater divides the surface of the globe primarily into an eastern and a western area, which he terms respectively *Palæogæa* and *Neogæa*. However, if we take into consideration not merely the minor differences on which the species and genera of birds and mammals are often based, but weigh the morphological value of groups, I think it becomes clear that the Nearctic province is really far more closely allied with the Palæarctic than with the Neotropical region, and that the inhabitants of the Indian and Ethiopian regions are much more nearly connected with one another and with those of the Palæarctic region than they are with those of Australia. And if the frontier line is latitudinal rather than longitudinal, and divides a north world from a south world, we must speak of *Arctogæa* and *Notogæa* rather than of Neogæa and Palæogæa as the primary distributional areæ. The secondary divisions, or geographical provinces, proposed by Dr. Sclater, answer, in great measure, to those which are suggested by the distribution of the *Alectoromorphæ*—except that, in common with many other naturalists, I think it would be convenient to recognize a *circumpolar* province, as distinct from the Nearctic and

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* Geogr. Dist. Anim., vol. i, pp. 65, 66.

† Nature, vol. iii, p. 427, March 30, 1871.

Palæarctic regions."[*] Professor Huxley thus emphatically recognizes a region equivalent to my North Temperate Realm.

Mr. Robert Brown, in writing of the distribution of the mammals of Greenland, also recognizes a North Temperate Region, which he divides into a European Temperate Province and a North American Temperate Province, from which he separates a Circumpolar Region, equivalent to the Arctic Realm above characterized.[†]

Dr. Gill, in regard to fishes, recognizes an "Arctogæan" region, "embracing Europe, Northern Asia, and Northern America", as distinct on the one hand from the American Tropical and Transtropical Region, and on the other from Tropical Asia and Africa.[‡]

Dr. Packard, in discussing the distribution of the Phalænid Moths, recognizes both an Arctic Realm and a North Temperate Realm, as here characterized. Referring to a previously given table of subalpine and circumpolar species, he says,—"This table indicates how wide are the limits of distribution of these species, and it will be seen how important it is to follow circumpolar and north-temperate insect-faunæ around the globe, from continent to continent. It will be then seen how inadequate must be our views regarding the geographical distribution of the animals and plants of our own continent, without specimens from similar regions in the same zones in the Old World. It will be found that for the study of the insect-fauna of the Rocky Mountains and Pacific coast we must have ample collections from the Ural and Altai Mountains and surrounding plateaus," etc.[§]

Dr. August von Pelzeln also recognized a circumboreal region ("arktische Region"), and considers the "Nearctic" and "Palæarctic" as forming inseparable parts of a single region. He says:—"Die paläarktische Region scheint mir von der nearktischen nicht trennbar zu sein, sondern beide dürften ein Ganzes bilden, welches man als arktische Region bezeichnen könnte. Ihre Zusammengehörigkeit tritt mit voller Evidenz in den hochnordischen Ländern des alten und neuen Continentes hervor und erst in niedereren Breiten macht sich die Differenzirung geltend.

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[*] Proc. Zoöl. Soc. Lond., 1868, pp. 314, 315.

[†] Proc. Zoöl. Soc. Lond., 1868, pp. 337, 338.

[‡] Says Dr. Gill:—"In fine, dividing the earth into regions distinguished by general ichthyological peculiarities, several primary combinations may be recognized, viz.:—1, an *Arctogæan*, embracing Europe, Northern Asia, and Northern America; 2, an *Asiatic*, embracing the tropical portions of the continent; 3, *African*, limited to the region south and east of the Desert; 4, an *American* (embracing the America *par excellence* dedicated to Amerigo Vespucci), including the tropical and transtropical portions; and, 5, an *Australasian*. Further, of these (*a*) the first two [Arctogæan and Asiatic] have intimate relations to each other, and (*b*) the last three others among themselves; and some weighty arguments may be adduced to support a division of the faunas of the globe into two primary regions coinciding with the two combinations alluded to—(*a*) a *Cænogæa* and (*b*) an *Eogæa*, which might represent areas of derivation or gain from more or less distant geological epochs."—*Ann. and Mag. Nat. Hist.*, 4th ser., vol. xv, 1875, pp. 254, 255.

[§] Monograph of Geometrid Moths, or Phalænidæ, of the United States, pp. 567, 586, 1876.

Die Vergleichung der Thierwelt beider Continente zeigt nämlich, dass die circumpolare Fauna in beiden dieselbe ist, dass in der Hochgebirgsfauna noch bedeutende Uebereinstimmung herrscht, dass in der übrigen paläo- und neoborealen Thierbevölkerung sowohl identische Arten als gemeinsam eigenthümliche Gattungen sich finden, endlich dass selbst jene Typen, welche jedem Continente eigenthümlich sind, doch eine gewisse Uebereinstimmung hinsichtlich des Charakters der Fauna an sich tragen, so dass sie einander näher stehen als Angehörigen anderer Regionen. In der neuen Welt ist eine Modification der Fauna auch durch das Eindringen neotropischer Formen gegeben."* He further also calls attention to the similarity of life which prevailed throughout this circumpolar region during the Quaternary period.

It is unnecessary to cite further, from the abundant material at hand, the opinions of specialists in reference to the propriety of recognizing a North Temperate Realm, as distinguished from the tropical regions of the globe, and in contradistinction from a north and south line of division of the North Temperate Zone into two primary ("Palæarctic" and "Nearctic") regions.

The chief differences between Dr. Sclater's division of the northern hemisphere and the present consist in setting off at the northward an Arctic Realm, the union of the so-called Nearctic and Palæarctic Regions into one circumpolar belt, and in the adoption for the same of a more northern limit than that proposed as the boundary of the two abovenamed Sclaterian regions. As will be shown later, the subdivisions of the North Temperate Realm or ("*Arctogæa*") as here defined agree in the main with the "subregions" of Sclater and Wallace. The more northward location of the southern boundary of the North Temperate Realm in North America results in the elimination of several characteristic tropical types, which extend a short way only into Dr. Sclater's Nearctic and Palæarctic Regions, and which, when considered as members of these regions, give false or misleading results when the two regions are contrasted on a numerical basis, grounded on the proportion of peculiar types,—numerous forms being thus reckoned as components of the Nearctic and Palæarctic regions which are properly tropical.

In North America, the division between characteristic temperate and tropical forms of life approximately coincides with the isotherm of 68° F., or somewhere between 68° and 70° F. This line begins on the Atlantic coast a little below the northern boundary of Florida, and runs thence westward along the Gulf coast to Southern Texas, and thence farther westward to the Pacific, not far from the international boundary between the United States and Mexico, swerving more or less northward or southward in accordance with the configuration and elevation of the land-surface. It thus leaves the greater part of the peninsula of Florida within the American Tropical Realm, to which the fauna of its southern half is certainly closely allied. A portion of the Mexican highlands are undoubtedly to be included in the North Temperate Realm, but their fauna is too little known to admit of the boundary being at present definitely drawn.

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* Verhandl. der K. K. Zool.-Bot. Gesell. in Wien, Bd. xxv, 1876, pp. 50, 51; see also p. 62.

On the other hand, the lower portion of the Great Colorado Valley and the coast region of Southern California are, perhaps, better referable to the American Tropical Realm than to the North Temperate. At the junction of the two realms, there must be a belt of debatable or doubtful ground. The approximate boundary I would place near the northern limit of distribution of such mammalian forms as *Nasua*, *Dicotyles*, *Manatus*, *Dasypus*, and the tropical species of *Felis* (as, *F. onca*, *F. pardalis*, *F. eyra*, and *F. yaguarundi*). This boundary also coincides quite nearly with the southern limit of distribution of the Lynxes, the Gray and Prairie Wolves, the Common Fox, the Mink, the Black and Grizzly Bears, the Wapati and Virginian Deer, the Bison, the Pronghorn, the Beaver, Prairie Dogs, Muskrat, the *Arvicolæ*, and the Moles (*Scalops* and *Condylura*). *Bassaris* is properly tropical, although straggling considerably farther northward than the other above-mentioned forms. Florida, for convenience, might be allowed to stand as a portion of the North Temperate Realm, although, as I have previously shown, it forms a distinct fauna, with strongly tropical affinities,* it having not less than twelve characteristically tropical genera of birds, several tropical genera of mammals (notably the Manatee and several Bats), and also several tropical genera of Reptiles and Batrachians, none of which range much, if any, to the northward of its southern half.

The southern boundary of the North Temperate Realm in the Old World may be doubtless approximately drawn near the same isotherm (about the mean annuals of 68° to 70° F.). This coincides closely with the southern boundary of the so-called Palæarctic Region. There is, however, here a broader belt of debatable or transitional ground than in the New World, into which so many tropical forms extend that it becomes almost a question whether the boundary between Tropical and Temperate life should not be carried considerably more to the northward, so as to leave Mr. Wallace's "sub-regions" 2 and 4 (Mediterranean and Manchurian) in the Tropical Realm rather than in the North Temperate. Despite, however, the presence of a considerable number of tropical genera in these regions, the North Temperate forms still greatly predominate. In the Western or "Mediterranean" district, for instance, we have species of *Macacus*, one of which even reaches the Spanish Peninsula. *Herpestes* has a similar northward extension. *Hyæna* and *Hystrix* range not only over most of this district, but also over the greater part of the Manchurian, where we again find a species of *Macacus*, and meet with *Semnopithecus*, while *Hyrax* just enters the Mediterranean from the southward. On the western border of the Manchurian we get also Pteropine Bats, and species of *Equidæ*, straggling remnants of the more northward extension of tropical life which inhabited this region during the middle and later portions of the Tertiary Period and in the Quaternary.

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* Bull. Mus. Zoöl., vol. ii, pp. 391, 392.

Divisions of the North Temperate Realm.—The North Temperate Realm is primarily divisible in two directions, giving in each two regions, namely, (1) by a longitudinal division into (*a*) a *North American Region* and (*b*) a *Europæo-Asiatic Region;* and (2) latitudinally, into (*a*) a *Cold Temperate* and (*b*) a *Warm Temperate Region.* The *Cold Temperate*, if limited on both continents by the isotherm of 36° F., presents a nearly uniform fauna throughout, its southern limit in both corresponding with the natural (that is, before modified by human agency) southern limit of distribution of *Tarandus* and *Alces.* While there is at this point in North America a well-marked transition in the fauna, the change in Europe and Asia appears to be less marked, the first important transition in the Old World being much farther southward, even as low almost as the isotherm of 60° F. Hence the divisions of the Temperate Realm in the Old World partake of the nature of *temperate* and *subtropical* rather than cold-temperate and warm-temperate. Here, in consequence of the great elevation and extent of the Himalayan Plateau, the northern or temperate division is greatly narrowed in Central Asia, where it becomes, according to Mr. Wallace, almost wholly separated into two quite widely detached regions, namely, the "Mediterranean" and "Manchurian Subregions".

As thus divided, the temperate and subtropical divisions of the Old World are very strongly marked. The latter consists mainly of Northern Africa, Asia Minor, Persia, Afghanistan and Beloochistan, Northern China, and Manchuria, with barely a narrow belt along the Mediterranean coast of Europe and the Spanish Peninsula. As already stated, it is strongly tinged with tropical forms. While there is a general prevalence of temperate types, we meet also with the large and essentially tropical forms of *Felis*, several Monkeys, several species of *Viverridæ*, *Hyæna*, *Hystrix*, *Equus*, and other distinctively tropical or subtropical types. The northern or temperate division of the Europæo-Asiatic Region seems to constitute two well-marked *provinces*, the one Eastern or European, the other Western or Asiatic. The former corresponds with Mr. Wallace's "European Subregion", exclusive of its northern third; the latter with his "Siberian Subregion", exclusive likewise of its boreal portion. For the southern or subtropical division I adopt the subdivisions proposed by Mr. Wallace, with, for the present, the boundaries he has assigned them,—namely, a Western or Mediterranean Province and an Eastern or Manchurian Province. These two provinces, as already noted, are quite widely separated, in consequence of the southward extension of the cold-temperate fauna over the Thibetan plateau to the Himalayas. The fauna of the Thibetan plateau is said by Mr. Blandford to be "essentially Boreal, Alpine and even Arctic types prevailing, the country having in many parts a climate scarcely equalled elsewhere for intensity of cold out of the Arctic Regions. This high barren tableland extends from Afghanistan to Yunan; it comprises the drainage-areas of the Upper Indus and the Sanpú, and is bounded on the north in its western portion by the Kuenluen range, but it is less defined and its boundaries less accurately known to the eastward, although much light has been thrown upon the subject by Prejewalski's explorations".* In the "List of Mammalia known to inhabit the Thibetan Plateau", given by Mr. Blandford, the only distinctively southern genus is *Equus*. The only peculiar genus is *Poëphagus*, but the list is evidently quite incomplete, the only Bat given being a species of *Plecotus*, and the only Insectivore a species of "*Crocidura*". *Budorcas*, usually attributed to Thibet, is excluded, and several other genera, as *Nectogale*, *Uropsilus*, and *Æluropus*, currently given as peculiar to the Thibet plateau, are not mentioned. While the Thibetan plains belong certainly to the colder division, so many types mainly restricted to this region occur that the question arises whether it may not be proper to recognize the region as a *Thibetian Province* of the Temperate Subregion.

North American Region.—The North American Region has been divided by Professor Baird into three "provinces", termed respectively "Eastern", "Middle", and "Western". Though not co-ordinate in point of differentiation with the divisions of the Europæo-Asiatic Region above recognized as provinces, they nevertheless possess distinctive features and form natural regions. They are of course far smaller in area, and possess a much smaller number of genera, but have about the same proportion of peculiar generic and subgeneric types.

In the subjoined tables an attempt is made to give lists of the genera of the two primary divisions of the North Temperate Realm, with approximate indications of their distribution in the various subdivisions of the two regions.†

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* Proc. Zoöl. Soc. Lond., 1876, pp. 632, 633.

† In these lists, as elsewhere in the tabulated lists given in this paper, it is not assumed that the groups adopted as "genera" are always of co-ordinate value. The equation attempted is doubtless open in many cases to criticism. While the attempt is made to assume an intermediate position between undue conservatism and excessive multiplication in respect to groups assumed by different writers as "generic", the lists can of course be considered only as provisional. Again, it is occasionally difficult to decide whether certain genera should be assigned, even in a general way, to one of the faunal divisions rather than to another. However defective the result, the intent has of course been to give a fair presentation of the facts of distribution.

Genera of the North American Region.

[NOTE.—The names of circumpolar genera are in *italics*; those of genera peculiar to the region, in SMALL CAPITALS.]

Genera.	Subregions.		Provinces.		
	Cold Temperate.	Warm Temperate.	Eastern.	Middle.	Western.
Felis	−	+	+	+	+
Lynx	+	+	+	+	+
Canis	+	+	+	+	+
Vulpes	+	+	+	+	+
UROCYON	−	+	+	+	+
Gulo	+	−	+	−	−
Mustela	+	?	+	+	+
Putorius	+	+	+	+	+
MEPHITIS	+	+	+	+	+
SPILOGALE	−	+	+	+	+
TAXIDEA	+	+	+	+	+
Lutra	+	+	+	+	+
Enhydris	+	−	−	−	+
Procyon	+	+	+	+	+
Ursus	+	+	+	+	+
Phoca	+	−	+	−	+
Pagomys	+	−	+	−	−
Pagophilus	+	−	+	−	−
Erignathus	+	−	+	−	−
Halichœrus	+	−	+	−	−
Cystophora	+	−	+	−	−
Eumetopias	+	+ ?	−	−	+
Zalophus	+	+ ?	−	−	+
Callorhinus	+	+ ?	−	−	+
Alces	+	−	+	−	−
Rangifer	+	−	+	−	−
Cervus	+	+	+	+	+
CARIACUS	−	+	+	+	+
MAZAMA	+	−	−	+	+
Ovis	+	−	−	+	+
Bison	+	+	+	+	−
ANTILOCAPRA	−	+	−	+	−
Nyctinomus	−	+	?	+	+ ?
Nycticejus	−	+	+	?	−
Lasiurus	+	+	+	+	+
Vesperugo	+	+	+	+	+
Vespertilio	+	+	+	+	+
Synotus	−	+	+	+	− ?
Antrozous	−	+	−	+	+
SCALOPS	−	+	+	+	+
SCAPANUS	−	+	+	+	+
Urotrichus	−	+	−	−	+
NEOSOREX	−	+	+	+	+
Sorex	+	+	+	+	+
BLARINA	−	+	+	+ ?	−
Sciuropterus	+	+	+	+	+

Genera of the North American Region—Continued.

Genera.	Subregions.		Provinces.		
	Cold Temperate.	Warm Temperate.	Eastern.	Middle.	Western.
Sciurus	+	+	+	+	+
Tamias	+	+	+	+	+
Spermophilus	+	+	−	+	+
CYNOMYS	−	+	−	+	+
Arctomys	+	+	+	+	+
HAPLODON	+	−	−	−	+
Neotoma	−	+	+	+	+
Sigmodon	−	+	+	−	−
OCHETODON	−	+	+	+	+
Hesperomys	+	+	+	+	+
Arvicola	+	+	+	+	+
Evotomys	+	−	+	−	−
SYNAPTOMYS	+	+	+	+	+
FIBER	+	+	+	+	+
ZAPUS	+	−	+	−	−
PEROGNATHUS	−	+	−	+	+
CRICETODIPUS	−	+	−	+	+
DIPODOMYS	−	+	−	+	+
GEOMYS	−	+	+	+	−
THOMOMYS	−	+	−	+	+
Castor	+	+	+	+	+
ERETHIZON	+	−?	+	+	+
Lepus	+	+	+	+	+
Lagomys	+	−	−?	+	+
Didelphys	−	+	+	+	+

Summary.

Whole number of genera	72
Peculiar to the region	23
Circumpolar	32
Of general distribution throughout the region	26
Occurring in the Cold Temperate Subregion	47
Occurring in the Warm Temperate Subregion	53–56
Land genera represented in the Eastern Province	47
Genera represented in the Middle Province	51
Land genera represented in the Western Province	48
Land genera restricted to the Eastern Province	*6
Genera common to the Middle and Western Provinces not represented in the Eastern Province	8
Genera restricted to the Middle Province	2
Land genera restricted to the Western Province	†3
Maritime genera restricted to the Eastern Province	5
Maritime genera restricted to the Western Province	5
Maritime genera occurring in both Eastern and Western Provinces	1

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* Plus 5 maritime = 11.

† Plus 5 maritime = 7.

Europæo-Asiatic Region.—The Europæo-Asiatic Region embraces a far greater (about four times greater) area than the North American, and is physically much more highly diversified. It is similarly divisible into a Cold Temperate Subregion and a Warm Temperate Subregion, and is further differentiated into a number of well-marked provinces, two of which belong to the Cold Temperate Subregion, and three or more to the Warm Temperate Subregion.*

Genera of the Europæo-Asiatic Region.

[NOTE.—A few almost exclusively tropical genera, which barely reach or doubtfully extend a short distance over the southern boundary of the region, are omitted as being not properly faunal elements of the region.

The names of circumpolar genera are in *italics*; those of genera peculiar to the region in SMALL CAPITALS.]

Genera.	Subregions.		Provinces.			
	Cold Temperate.	Warm Temperate.	Western Temperate.	Eastern Temperate.	Mediterranean.	Manchurian.
Macacus	−	+	−	−	+	+
Felis	−	+	−	−	+	+
Lynx	+	+	+	+	+	+
Cynælurus	−	+	−	+	+	+
Genetta	−	+	−	−	+	−
Herpestes	−	+	−	−	+	+
Hyæna	−	+	−	−	+	+
Canis	+	+	+	+	+	+
Cuon	+	+	−	+	−	+
Vulpes	+	+	+	+	+	+
Arctonyx	−	+	−	+	−	+
NYCTEREUTES	−	+	−	−	−	+
Gulo	+	−	+	+	−	−
Mustela	+	−	+	+	−	−
Putorius	+	+	+	+	+	+
Lutra	+	+	+	+	+	+
LUTRONECTES	−	+	−	−	−	+
Enhydris	+	−	−	+	−	−
Mellivora	−	+	−	+	−	+
MELES	+	−	+	+	−	−
Ælurus	−	+	−	−	−	+
ÆLUROPUS	−	+	−	−	−	+

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* I am far from sure that what is here recognized as the "Mediterranean Province" should not be subdivided, and the Eastern or Persian division recognized as a "Persian Province". If the Eastern, Middle, and Western divisions of the North American Region are to be accorded the rank of "Provinces", it may be necessary to admit, on similar grounds, a "Japanese Province"; but I am not at present prepared to adopt these divisions as "Provinces". To make the Provinces of the North American and Europæo-Asiatic Regions more nearly co-ordinate, I should prefer to unite the Middle and Western Provinces of the North American Region as forming a single Province. In fact, it seems doubtful whether the North American Region is differentiated into primary divisions that should be regarded as having co-ordinate rank with the Mediterranean and Manchurian divisions of the Europæo-Asiatic Region.

Genera of the Europæo-Asiatic Region—Continued.

Genera.	Subregions.		Provinces.			
	Cold Temperate.	Warm Temperate.	Western Temperate.	Eastern Temperate.	Mediterranean.	Manchurian.
Ursus	+	+	+	+	+	+
Callorhinus	+	–	–	+	–	–
Zalophus	+	+	–	+	+	+
Eumetopias	+	+	–	+	+	+
Phoca	+	–	+	+	–	–
Pagomys	+	–	+	+	–	–
Pagophilus	+	–	+	+	–	–
Halichærus	+	–	+	–	–	–
Erignathus	+	–	+	–	+	–
PELAGIUS	–	+	–	–	+	–
Cystophora	+	–	+	–	–	–
CAMELUS	–	+	–	–	+	+
Alces	+	–	+	+	–	–
Rangifer	+	–	+	+	–	–
Cervus	+	+	+	+	+	+
DAMA	–	+	–	–	+	–
ELAPHODUS	–	+	–	–	–	+
LOPHOTRAGUS	–	+	–	–	–	+
CAPREOLUS	+	+	+	–	+	+
MOSCHUS	–	+	–	–	+?	+
HYDROPOTES	–	+	–	–	–	+
Bison	+	–	+	–	–	–
POËPHAGUS	–	+	–	–	–	+
ADDAX	–	+	–	–	+	–
Oryx	–	+	–	–	+	–
Gazella	–	+	–	–	+	–?
PROCAPRA	–	+	–	+	+	+
SAIGA	–	+	–	–	+?	+?
PANTHALOPS	–	+	–	+	–	–
BUDORCAS	–	+	–	+	–	+
RUPICAPRA	–	+	–	–	+?	+?
Nemorhædus	–	+	–	–	–	+
Capra	–	+	–	–	+	–?
Ovis	+	+	–	+	+	+
Ammotragus	–	+	+	–	+	–
Sus	+	+	+	+	+	+
Asinus	–	+	–	–	+	+
Rhinolophus	–	+	–	–	+	+
Plecotus	–	+	–	–	+	–
Synotus	–	+	–	–	+	+
Vesperugo	+	+	+	+	+	+
Vespertilio	+	+	+	+	+	+
Miniopterus	–	+	–	–	+	+
Taphozous	–	+	–	–	+	+
Rhinopoma	–	+	–	–	+	+?
Nyctinomus	–	+	–	–	+	+
Erinaceus	+	+	+	+	+	+
Talpa	+	+	+	+	+	+

Genera of the Europæo-Asiatic Region—Continued.

Genera.	Subregions.		Provinces.			
	Cold Temperate.	Warm Temperate.	Western Temperate.	Eastern Temperate.	Mediterranean.	Manchurian.
SCAPTOCHIRUS	−	+	−	−	−	+
ANUROSOREX	−	+	−	−	−	+
MYOGALE	−	+	+?	−	+	−
NECTOGALE	+	−	−	+	−	−
Urotrichus	−	+	−	−	−	+
UROPSILUS	+?	+?	−	+?	−	+?
Sorex	+	+	+	+	+	+
CROSSOPUS	+	−	+	−	−	−
Crocidura	−	+	−	−	+?	+?
Mus	+	+	+	+	+	+
CRICETUS	+	+	+	+	+	+
CRICETULUS	−	+	−	−	−	+
Meriones	−	+	−	−	+	+?
RHOMBOMYS	−	+	−	−	+	+?
PSAMMOMYS	−	+	−	−	+	−
SMINTHUS	+	−	+	+	−	−
Arvicola	+	+	+	+	+	+
Evotomys	+	−	+	+	−	−
MYOSPALAX	−	+	−	−	−	+
ELLOBIUS	+	−	+	+?	−	−
SIPHNEUS	+	−	+	−	−	−
SPALAX	+	+	+	+	−	−
Dipus	−	+	−	−	+	+
ALACTAGA	+	+	+	+	+	−
MYOXUS	+	+	+	−	+	−
Muscardinus	+	+	+	+	+	+
Eliomys	−	+	+	−	+	−
Castor	+	−	+	+	−	−
Sciurus	+	+	+	+	+	+
Tamias	+	−	+	+	−	−
Sciuropterus	+	+	+	+	+	+
Pteromys	−	+	−	−	−	+
Spermophilus	+	−	+	+	−	+
Arctomys	+	−	+	+	−	−
Hystrix	−	+	−	−	+	−
Lagomys	+	−	+	+	−	−
Lepus	+	+	+	+	+	+

Summary.

Whole number of genera	107
Peculiar to the region	36
Circumpolar	22
Of general distribution throughout the region	15
Occurring in the Cold Temperate Subregion	54
Occurring in the Warm Temperate Subregion	80
Genera occurring in the Western Temperate (European) Province	48

Genera occurring in the Eastern Temperate (Asiatic) Province	46
Genera of the Mediterranean Province	60
Genera of the Manchurian Province	65
Genera common to the Eastern and Western Temperate Province	38
Genera common to the Mediterranean and Manchurian Province	50
Maritime genera of the Asiatic coast	8
Maritime genera of the European coast	6
Maritime genera common to both European and Asiatic coasts	3

In comparing the North American Region with the Europæo-Asiatic Region, the following resemblances and differences become apparent:—1. The number of genera in the Europæo-Asiatic Region is rather more than one-fourth greater than in the North American Region, with consequently a smaller proportion of circumpolar genera. 2. But this difference results almost wholly from the greater preponderance of peculiar types in the Southern Subregion, due evidently to the immensely greater extent and greater physical diversity of this portion of the Europæo-Asiatic Region as compared with the corresponding portion of the North American Region. 3. While the colder portions of the two regions have each about the same number of genera, which are in great part (*nearly two-thirds*) common to the two regions, the Warm Temperate (really Subtropical) Subregion of the Europæo-Asiatic Region has a far greater number of genera that do not extend to the northward of it than has the Warm Temperate Subregion of the North American Region, while a small proportion only (chiefly arctopolitan and subtropicopolitan) are common to the two subregions. Hence, 4. The two regions (Europæo-Asiatic and North American) are mainly differentiated (as already noticed) through the presence of genera limited to their southern subregions.

III.—AMERICAN TROPICAL REALM.

The American Tropical Realm is approximately bounded by the northern and southern mean annuals of 70° F. Its northern boundary has been already indicated in defining the southern limit of the North Temperate Realm, it being concurrent with the southern boundary of the North American Temperate Region. The southern boundary of the American Tropical Realm leaves the Atlantic coast near the thirtieth degree of south latitude, or near the southern extremity of Brazil, but in passing from the coast sweeps rapidly northward till it nearly or quite reaches the Tropic of Capricorn in Northeastern Buenos Ayres; it then bends to the southward and continues westward to the eastern base of the Andes. The Andean chain forms its western limit thence northward to Ecuador, where it crosses the Andean highlands and is again deflected southward, thus including a narrow belt of the coast region west of the Andes in Northwestern Peru.

As thus defined, the southern border of the American Tropical Realm is nearly coincident with the southern boundary of the "Brazilian

Region" as mapped by Mr. Wallace,* Brazil, nearly all of Paraguay, and Bolivia east of the Andes being included within this realm.

Its characteristic genera include all of the American Quadrumanes (families *Cebidæ* and *Mididæ*,=*Hapalidæ* of most authors), all the American Edentates, and nine-tenths of the American Marsupials. It is also the home of nearly all the American *Felidæ*, except the Lynxes. It also has many peculiar genera of *Glires* and *Chiroptera*, while it almost altogether lacks the characteristic forms of mammalian life found in the northern temperate regions. Among the characteristic North American types unrepresented in the American Tropical Realm are, among Carnivores, not only the Lynxes, but the true Wolves and Foxes, the Martens, Wolverenes, Badgers, and Bears; among Ungulates, the Pronghorn, the Bison, Mountain Sheep, and Mountain Goat, and several important genera of the *Cervidæ;* among Rodents, the Spermophiles, Marmots, Muskrat, Beaver, Pouched Rats, "Gophers" (*Geomys* and *Thomomys*), the numerous species of *Arvicola*, etc.,—in short almost all of the prominent and characteristic genera of the order except the almost cosmopolitan genera *Lepus* and *Sciurus;* among Insectivores, all the Moles and Shrews, except a few forms of the latter, which extend over most of the Central American Region.

The American Tropical Realm is divisible into three regions,—the Antillean, the Central American, and the Brazilian. The Antillean Region includes only the West Indies and the southern extremity of Florida. The Central American Region embraces Mexico (exclusive of the elevated tablelands), the whole of Central America, and the extreme northern parts of South America (Venezuela north of the Orinoco Basin, Northern and Western New Granada, and most or all of that portion of Ecuador west of the Andes). The Brazilian Region comprises all the intertropical parts of South America not embraced in the Central American Region, including the whole area east of the Andes southward to the boundary already given.

Central American Region.—Of the genera occurring in the Central American Region (see subjoined table), only about one-ninth can be considered as peculiar to the region; about one-sixth are either subcosmopolitan or tropicopolitan; about three-fifths range also over the Brazilian Region, and a few over nearly all of South America; about one-half extend far into North America, among which are several that are also common to the greater part of the North Temperate Realm, while about one-eleventh are also found over most of both North America and South America. Aside from the few peculiar genera, the fauna is composed largely of genera common also to the Brazilian Region, which find their northern limit of distribution within the Central American Region, plus a very large proportion that extend southward from the North American Temperate Region, and which find their southern limit of distribution within the region under consideration. Its distinctive feature is hence an approximately equal blending of temperate and tropical forms, whose respective habitats here overlap. Many of the northern forms do not quite reach the southern limit of the region, just as many of the southern forms do not quite reach its northern limit. It is distinguished from the North American Temperate Region by the preponderance of tropical life, and from the Brazilian Region by the copious intermingling therewith of northern forms, an element wholly lacking in the Brazilian Region.

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* Geogr. Dist. Anim., vol. ii, map facing page 3.

Genera of the Central American Region.

Mainly or wholly restricted to the region.	Ranging also over much of the Brazilian Region.			
Bassariscyon.	Aluatta.	Cercoleptes.	Phyllostoma.	Arctopithecus.
Bassaris.	Cebus.	Nasua.	Arctibeus.	Tatusia.
Elasmognathus.	Sapajou.	Coassus.	Stenoderma.	Tamandua.
Macrotus.	Nyctipithecus.	Notophorus.	Centurio.	Cyclothurus.
Myxomys.	Callithrix.	Dicotyles.	Desmodus.	†Didelphys.
Heteromys.	Saimiris.	*Manatus.	Reithrodon.	Chironectes.
	Galictis.	Noctilio.	Cercolabes.	
	Grisonia.	Mormops.	Dasyprocta.	
	Conepatus.	Vampyrus.	Cœlogenys.	
Ranging also over much of the North American Temperate Region.		**Tropicopolitan.**	**Subcosmopolitan.**	
Urocyon.	§Spermophilus.	Nyctinomus.	Felis.	Lepus.
‡Procyon.	Neotoma.	Molossus.	Putorius.	
Cariacus.	Sigmodon.		Lutra.	
‡Lasiurus.	Ochetodon.		Vesperugo.	
Nycticejus.	Hesperomys.		Vespertilio.	
Blarina.	§Arvicola.		Sorex.	
§Sciuropterus.	Perognathus.		Sciurus.	

* Also West African.
† Also warmer parts of North America.
‡ Also nearly all of both North and South America.
§ Arctopolitan.

Summary.

Whole number of genera	63
Peculiar or mainly limited to the region	6
Occurring also over most of the Brazilian Region	40
Occurring also over much of the North American Region	24
Occurring also over most of both North and South America, but not in the Old World	5
Subcosmopolitan	8
Tropicopolitan	2

Antillean Region.—The Antillean Region differs from both the Central American and Brazilian most strongly in negative characters—through what it lacks rather than in what it has—although it possesses a number of peculiar genera. The *Chiroptera* form two-thirds of the genera and not less than five-sixths of the species. Of the eight peculiar genera, five are Bats, the others being *Solenodon* (the only Insectivore), *Capromys*, and the closely allied *Plagiodonta*, which together constitute a family peculiar to the region. Two orders—*Primates* and *Bruta*—highly characteristic of the Central American and Brazilian regions, are wholly absent. There are also no Ungulates, very few Carnivores, and very few Rodents; the latter, however, are of mostly peculiar species, as are many of the Bats. The single Insectivore is of a remarkable type, which finds its nearest ally in the remote island of Madagascar, the ordinary Insectivores of the neighboring Central American and North American Regions being wholly unrepresented.

Genera of the Antillean Region.

Peculiar to the region.	Tropical American.		Wide-ranging.
Nycticellus.	Nasua.	Mormops.	Lutra.
Lonchorhina.	Cercoleptes.	Macrotus.	Procyon.
Phyllodia.	Manatus.	Vampyrus.	Lasiurus.
Brachyphylla.	Natalus.	Arctibeus.	Vesperugo.
Phyllonicteris.	Thyroptera.	Stenoderma.	Vespertilio.
Solenodon.	Noctilio.	Heteromys.	Hesperomys[*]
Capromys.	Molossus.	Dasyprocta.	
Plagiodonta.	Nyctinomus.	Didelphys.	
	Chilomycteris.		

Brazilian Region.—Of about ninety commonly recognized genera, a little less than one-third may be considered as either wholly or mainly restricted to the region; a little less than another third range to the northward over much of the Central American Region, and may be considered as characteristic of the American Tropical Realm at large rather than of the Brazilian Region. About one-tenth of the remaining genera occur also over a large part of the Central American Region, while the remainder are divided about equally between tropicopolitan and cosmopolitan genera, and those that range southward over the South American Temperate Realm. One genus is also East Indian and another African, while quite a number range throughout the temperate and tropical parts of both Americas, and a few others over Temperate South America.

It is eminently characterized by its dozen genera of Monkeys, which, excepting a few that range into the Central American Region, are restricted wholly to this region; also by twelve to fifteen genera of Bats, which are scarcely found beyond its borders; nearly as many genera of Rodents, and quite a number of peculiar genera of other groups. Negatively it is characterized by the absence of Insectivores, the great bulk of the northern types of Carnivores, Ungulates, and Rodents. Its sole affinity with the life of the North Temperate Realm consists in the presence of a few such wide-ranging (cosmopolitan) genera as *Felis*, *Sciurus*, *Lepus*, *Vespertilio*, etc., and two other genera (*Procyon* and *Didelphys*) that range far into North America.

It is susceptible of division into several provinces, upon the detailed consideration of which it is not proposed at present to enter. These are the Upper Amazonian Province, embracing the region drained by the Upper Amazon and its principal tributaries (Western Brazil and those portions of Peru and Bolivia east of the Andes); the Lower Amazonian Province, embracing the Lower Amazonian and Orinoco Basins; and the Southeast Brazilian Province, embracing Southeastern Brazil and Paraguay. They are characterized by the occurrence of numerous peculiar species rather than by peculiar genera. The genus *Lagothrix* appears to be confined, however, to the Upper Amazonian Province, *Chrysothrix* to the Lower Amazonian, and *Brachyteles* to the Southeast Brazilian, where occur also *Icticyon*, *Thous*, *Lycolepex*, etc., not found in the other regions, but ranging thence southward to Patagonia.

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[*] Dr. Coues gives *Hesperomys* (*Oryzomys*) *palustris* as Jamaican.—*Mon. N. Am. Rod.*, 116, foot-note.

Genera of the Brazilian Region.

Mainly confined to the Brazilian Region.			
Lagothrix.	Pteronura.	Oxymicterus.	Bradypus.
Eriodes.	*Tapirus.	Dactylomys.	Prionodontes.
Pithecia.	Macrophyllum.	Cercomys.	Xenurus.
Brachyurus.	Vampyrus.	Mesomys.	Tolypeutes.
Nyctipithecus.	Saccopteryx.	Echimys.	Myrmecophaga.
Cheropotes.	Diphylla.	Loncheres.	Hyracodon.
Midas.	Habrothrix.	Chætomys.	Chironectes.
Icticyon.	Holochilus.	Hydrochœrus.	
Tropical America generally.			
Aluatta.	§Procyon.	Arctibeus.	Dasyprocta.
Cebus.	†Manatus.	Stenoderma.	Cœlogenys.
Sapajou.	Coassus.	Natalus.	Arctopithecus.
Callithrix.	Dicotyles.	Furripterus.	Chœlopus.
Saimiris.	Notophorus.	Thryoptera.	Tatusia.
Hapale.	Desmodus.	Noctilio.	Tamandua.
Galictis.	Schizostoma.	§Nycticejus.	Cyclothurus
Grisonia.	Centurio.	§Lasiurus.	§Didelphys.
Conepatus.	Sturnira.	‡Chilomycteris.	
Cercoleptes.	Phyllostoma.	‡Calomys.	
Nasua.	Glossophaga.	Cercolabes.	
Extending also over Temperate South America.		**Subcosmopolitan and tropicopolitan.**	
Chrysocyon.	Cavia.	Felis.	Vesperugo.
Lycalopex.	Kerodon.	Lutra.	Vespertilio.
Pseudalopex.	Myopotamus.	Nyctinomus.	Sciurus.
Blastocerus.	Dasypus.	Molossus.	Lepus.
Ctenomys.		Dysopes.	

* Also East Indian.
† Also West African.
‡ Also Temperate South America.
§ Also North American.

Summary.

Whole number of genera	90
Mainly restricted to the region	31
Of general distribution throughout the American Tropical Realm	41
Occurring also over much of the South American Temperate Realm	9
Occurring also in the warmer parts of the North Temperate Region	6
Tropicopolitan	3
Cosmopolitan	6

IV.—SOUTH AMERICAN TEMPERATE REALM.

What is here termed the South American Temperate Realm embraces all that portion of the South American continent and adjacent islands not included in the American Tropical Realm as already defined. It coincides very nearly with Mr. Wallace's "South Temperate America or Chilian Subregion".* Its northern limit on the Atlantic coast is near the thirtieth parallel. On leaving the Atlantic coast, the northern boundary passes obliquely northwestward, rising in the region of the Chaco Desert, to, or possibly a little beyond, the Tropic of Capricorn. Again descending to about the twenty-fifth parallel, it turns abruptly northward and eastward, along the eastern border of the Andean chain, nearly to the fifth degree of south latitude, near which point it strikes the Pacific coast. It thus embraces a large part of the great Andean plateau, with the neighboring coast region to the westward, nearly all the La Plata plains, and the region thence southward to Tierra del Fuego, which belongs also to this region.

As contrasted with the Tropical Realm to the northward, it is characterized, in respect to mammals, by the absence of all *Quadrumana* and the paucity of Edentates and Marsupials, there being neither Sloths nor Anteaters, while only two or three species of Opossums barely extend over its borders; the absence of all genera of Leaf-nosed Bats, and of not less than a dozen important genera of Rodents, the Coatis, the Kinkajou, the Tapirs, and many other genera characteristic of the American tropics.† As noted by Mr. Wallace, it is further characterized by the possession of the entire family of the *Chinchillidæ*, the genera *Auchenia*, *Habrocomus*, *Spalacopus*, *Actodon*, *Ctenomys*, *Dolichotis*, *Myopotamus*, *Chlamadophorus*, to which may be added the marine genera *Otaria*, *Arctocephalus*, *Morunga*, *Lobodon*, and *Stenorhynchus*, very few of which range beyond the northern border of this region. The Spectacled Bear is also confined to it, and here are also most largely developed the Murine genera *Calomys*, *Acodon*, and *Reithrodon*.

Although one of the smallest of the primary regions, it is apparently divisible into two more or less well-marked provinces, which may be respectively termed the Andean and Pampean. The Andean Province is principally characterized by the presence of *Ursus* (*Tremarctus*) *ornatus*, the genera *Pudu*, *Furcifer*, *Tolypeutes*, *Chlamydophorus*, *Chinchilla*, *Lagidium*, *Spalacopus*, *Habrocomus*, and *Octodon*. *Auchenia* and several genera of Rodents range from the Andean Province southward over the plains of Patagonia to Tierra del Fuego. The Patagonian plains share largely in the general *facies* of the Andean fauna. A few genera only are restricted to the Pampean Province, these being mainly *Ctenomys*, *Lagostomus*, and *Dolichotis*. The differences between these two provinces relate mainly to species rather than to genera. The Pampean Province is much the smaller, embracing only the comparatively level pampa district bordering the La Plata and Lower Parana Rivers. So little is definitely known respecting the range of the mammals of this general region that it is scarcely practicable to attempt at present a definition of the boundaries between the Pampean and Andean divisions.

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* Geog. Distr. Animals, vol. ii, p. 36, and map of the "Neotropical Region".

† Among the genera of the Brazilian Region here unrepresented are, aside from the *Quadrumana*, *Cercoleptes*, *Nasua*, *Tapirus*, *Bradypus*, *Chœlopus*, *Myrmecophaga*, *Tamandua*, *Cyclothurus*, *Phyllostoma*, *Glossophaga*, *Arctibeus*, *Dysopes* (and other genera of *Chiroptera*), *Hydrochœrus*, *Cercomys*, *Dactylomys*, *Loncheres*, *Echimys*, *Cœlogenys*, *Dasyprocta*, *Chœtomys*, *Cercolabes*, *Lepus*, *Sciurus*, *Habrothrix*, *Oxymycterus*, *Holochilus*, etc., = 27 +.

The relation of the South Temperate American to the Tropical American Realm is of course far closer than to any other, there being as usual a gradual transition between the two along their line of junction, through the extension of a few forms characteristic of the one for a short distance into the other, just as has been observed to be the case between the North Temperate and Tropical American Realms. It has, however, nothing in common with the North Temperate American Realm beyond the presence of a few cosmopolite types that extend across the intermediate Tropical Realm. So far as land mammals are concerned, it has no genera common to the South Temperate portions of the Old World, except a few that are almost cosmopolite. The case is different, however, with the marine species. Of the half dozen or more genera of Pinnipeds (the only marine forms we are here called upon to consider), none are peculiar to the shores of Temperate South America but are common to South Temperate and Antarctic shores generally. None of them, however, occur north of the tropics,* and it is hence only through these that there is any closer affinity between the mammalian life of this region and the South Temperate Zone generally than between it and that of north-temperate latitudes.

Of the thirty-four land genera below enumerated as occurring in the South American Temperate Realm, rather more than one-half (eighteen) are nearly or wholly confined to it. Most of the remainder extend far to the northward into Tropical America, and others reach North America, while five are almost cosmopolitan.

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* *Otaria* alone reaches the Galapagos, which, although situated under the equator, are still within the influence of the cold Peruvian current, and appear to constitute an outlying element of the South American Temperate Realm.

Genera of the South American Temperate Realm.

Mainly or wholly limited to the region.		Marine, and mainly Antarctic.	Wide-ranging.	
Tremarctus.	Ctenomys.	Otaria.	Felis.	Cavia.
Furcifer.	Drymomys.	Arctocephalus.	Pseudalopex.	Myopotamus.
Pudu.	Dinomys.	Lobodon.	Lycolopex.	Calomys.
Auchenia.	Chinchilla.	Stenorhynchus.	Chrysocyon.	Habothrix.
Lophostoma.	Lagidium.	Morunga.	Putorius.	Tatusia.
Octodon.	Lagostomus.		Lutra.	Didelphys.
Spalacopus.	Dolichotis.		Conepatus.	
Habrocoma.	Chlamydophorus.		Vespertilio.	
Reithrodon.			Vesperugo.	
Acodon.			Kerodon.	

V.—THE INDO-AFRICAN REALM.

The Indo-African Realm consists mainly of Intertropical Africa and Intertropical Asia, to which it seems proper to add Extratropical South Africa. The small portion of Africa south of the Southern Tropic lies wholly within the warm-temperate zone. Its small extent and broad connection with Tropical Africa render its separation as a distinct realm (as I at one time rather hastily considered it) almost inadmissible, since it is especially open to the influence of the great intertropical African fauna, as is shown by the extension of many tropical forms down to within a few degrees of its southern extremity. The area really possessing a temperate climate is restricted to its extreme southern border, where alone appear the few generic and family types that do not have a very general range over the tropical portions of the continent. This area is many times smaller than the temperate portion of South America, but, though so small, has quite a number of peculiar genera, which impart to it quite distinctive features. It yet seems better to regard it as an appendage of the great Indo-African Realm rather than as a distinct primary region. Madagascar, with the Mascarene Islands, on the other hand, while perhaps possessing a closer affinity with Africa than with any other continental region, has yet a fauna made up so largely of peculiar types that it seems more in accordance with the facts of distribution to regard it as a separate primary region.

The Indo-African Realm, as thus restricted, forms a highly natural division. Although its two principal areas are quite widely separated, being in fact geographically almost wholly disassociated, they possess a wonderful degree of similarity. Of the fifty commonly recognized families of mammalia occurring within its limits, three-fifths are distributed throughout almost its whole extent. Of the remainder, one-half are confined to Africa, and one is African and American, leaving only nine in India that are unrepresented in Africa; three only of these latter are, however, peculiar to the Indian Region ; all extend beyond it to the northward, five of them even occurring over the greater part of the northern hemisphere. Thus the African Region is the more specialized division, only a small portion of the tropical element in the Indian Region, through which it is differentiated from the great Europæo-Asiatic Temperate Region, being unrepresented in the African, while the African has three times as many peculiar families as the Indian.* As shown by the subjoined table, thirty of the fifty Indo-African families have a wide extralimital distribution, not less than one-fourth being emphatically cosmopolitan.

Families of Mammals represented in the Indo-African Realm, arranged to show (approximately) their distribution.

Occurring in the Indian Region, but not in the African.	Peculiar to the African Region.[1]	Common to both regions.		Common to both Regions, and also of wide extralimital range.
* TARSIIDÆ.	Protelidæ.	Simiidæ.	‖ Nycteridæ.	Felidæ.
† Æluridæ.	Hippopotamidæ.	Semnopithecidæ.	Erinaceidæ.	Canidæ.
‡ Ursidæ.	Phacochœridæ.	Cynopithecidæ.	Myoxidæ.	Mustelidæ.
‡ Cervidæ.	Giraffidæ.	Lemuridæ.	Spalacidæ.	Bovidæ.
† Camelidæ.	Hyracidæ.	Viverridæ.	Dipodidæ.	Pteropodidæ.
§ Tapiridæ.	Chrysochloridæ.	Hyænidæ.	Manididæ.	Rhinolophidæ.
* GALEOPITHECIDÆ.	Macroscelidæ.	Tragulidæ.		Vespertilionidæ.
‡ Talpidæ.	Potamogalidæ.	Equidæ.		Soricidæ.
* TUPAYIDÆ.	Lophyiomyidæ.	Suidæ.		Octodontidæ.
	Orycteropodidæ.	Rhinocerotidæ.		Sciuridæ.
		Elephantidæ.		Hystricidæ.
		Halicoridæ.		Leporidæ.

[1] The *Trichechidæ* (= *Manatidæ*) occur in Africa but not in India, but are found also in the warmer parts of America.

* Wholly restricted to the Indian Region.
† Mainly restricted to the Indian Region.
‡ Of wide extralimital range.
§ Found also in Intertropical America.
‖ Chiefly African.

Summary.

Whole number ....
Of general distribution throughout the realm ....
Peculiar to the African Region ....
Peculiar to the Indian Region ....
Occurring in the Indian Region, but not in the African ....
Of wide extralimital range ....

African Region.—The African Region, as here recognized, is nearl equivalent to Mr. Wallace's "Ethiopian Region", with the exclusio of his "Lemurian Subregion". Its northern boundary will be provisionally considered as the northern mean annual of 70° F.

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* Mr. Wallace has arrived at rather different conclusions respecting the speciali tion of the African Region, since he considers its specialization due wholly to t peculiar forms developed in Madagascar. Deducting these—for he considers Madagas and its neighboring islands as forming a "subregion" merely of the "Palæotropical" he believes would leave, in respect to specialization, the African and Indian Regi "nearly equal". In this comparison, however, I wholly exclude the Madagascan "Lemurian" fauna, and still find Africa a considerably more specialized region.

As thus limited, the greater part of the Arabian Peninsula and the southern portion of the Great Sahara belong to it. But just how much of the latter belongs here, and how much to the Mediterranean Region, cannot at present be readily determined. As already noticed, it consists largely of transitional ground, and is as yet quite imperfectly known. It is to some extent, doubtless, also a barrier region; but that it is by no means an impassable obstacle is sufficiently shown by the large number of generic types of mammals that extend from the Indian Region as far southward even as the Cape of Good Hope. Even if it were an insurmountable barrier, the comparatively humid and fertile eastern coast border would afford a sufficient highway of intercommunication between Tropical Asia and Tropical Africa, and the community of life of the two regions shows that for long ages there has been this open way of interchange.

The African Region, considering its great extent and its tropical climate, is to a great degree zoölogically a unit, yet it is by no means homogeneous. At least, three subdivisions may be recognized, each of which is characterized by many peculiar genera. These subregions have already been characterized by Mr. Wallace under the names of Eastern, Western, and Southern. The Western (West African Province) consists of the humid, heavily wooded region of the west coast, extending to a considerable, but at present not definitely determinable, distance into the interior, but probably with boundaries nearly as drawn by Mr. Wallace.* The Eastern (East African Province) includes the remainder of Intertropical Africa, while to the Southern (South African Province) belongs the southern extratropical portion of the continent.

Of these divisions, the Eastern contains the greatest number of genera, as it likewise contains by far the greatest area; but it is the least specialized, only *two-fifteenths* of its genera being peculiar to it, while of the genera of each of the other regions about *one-fourth* are peculiar. Nearly one-half (about forty-four per cent.) of the genera of the Eastern Province have a more or less general distribution over the whole African Region, while only a little more than a third (thirty-three to thirty-eight per cent.) of the genera of the other province have a similarly wide range.

A much larger proportion of Indian genera are represented in the Eastern and Southern Provinces than in the Western. This difference is due to obvious conditions, the fertile belt of the Nile district and adjoining coast forming an easy way of intercommunication between the two former not equally open to the Western Province. The Eastern and Southern Provinces further resemble each other in consisting largely of grassy plains, and in being, *par excellence*, the land of Antelopes. On the other hand, the Western Province, in consequence of its moist climate and dense forests, is the metropolis of the African Quadrumanes, to which region no less than six genera are restricted, and where all but one are represented, while only four occur in the Eastern, and merely a few outlying species reach the Southern. Hence the Eastern and Southern Provinces are far more closely allied than is either with the Western.

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* The conclusions and details here presented were worked out independently and *de novo* by the present writer. That they agree so closely with the views and results attained by Mr. Wallace, so far as Africa south of the Great Desert is concerned, is to me a source of gratification. In order to avoid unconscious bias I purposely avoided a detailed study of Mr. Wallace's writings on this subject till my own results were written out, and on then comparing my own conclusions with those reached by Mr. Wallace, became for the first time aware of their close agreement.

Eastern Province.—The East African Province or "Subregion" includes, as claimed by Mr. Wallace, not only East Africa proper, but also a considerable portion of the Great Sahara and the whole of the northern portion of Tropical South Africa, thus bounding the Western Province on three sides. In other words, it not only includes East Africa and Southern Arabia, but all of Tropical Africa, except the western portion, situated (speaking generally) between latitude 15° north and latitude about 22° south. As is well known, it consists mainly of a moderately elevated plateau, rising, in Abyssinia, into lofty mountains. It is generally an open region, "covered with a vegetation of high grasses or thorny shrubs, with scattered trees and isolated patches of forest in favorable situations. The only parts where extensive continuous forests occur are on the eastern and western slopes of the great Abyssinian plateau, and on the Mozambique coast from Zanzibar to Sofala."* It is worthy of note that the species peculiar to the province occur almost exclusively in Mozambique, or in Abyssinia and adjoining portions of Northeast Africa, a few extending into the Arabian Peninsula.

Of the ninety genera occurring in this province, ten, which are almost cosmopolite, may be considered as having too wide a range to possess any special significance. Of the remaining eighty, about one-fourth are found also in the Indian Region, leaving three-fourths (thirty-nine) as peculiarly African. Of these, twelve only are restricted to the Eastern Province, sixteen being common to the Southern Province, and ten to the Western. The subjoined tabular list indicates approximately the distribution of the genera of the Eastern Province.

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* Wallace, Geogr. Dist. Anim., vol. i, p. 259.

Genera of the East African Province.

Restricted to the province.	Exclusively African, but occurring also in the other provinces.		
*Theropithecus.	Colobus.	Giraffa.	Phacochœrus.
*Galerella.	Guerza.	Oreas.	Rhinaster.
Rhinogale.	Cercopithecus.	Tragelaphus.	Hyrax.
*Neotragus.	Cynocephalus.	Oreotragus.	Dendrohyrax.
Nesotragus.	Galago.	Æpyceros.	Epomophorus.
†Petrodromus.	Athylax.	Kobus.	Macroscelides.
†Rhynchocyon.	Ichneumea.	Nanotragus.	Cricetomys.
†Saccostomus.	Bdeogale.	Cephalophus.	Steatomys.
†Peleomys.	Helogale.	Ægocerus.	Otomys.
*Lophiomys.	Mungos.	Alcelaphus.	Georychus.
†Heliophobius.	Crossarchus.	Connochetes.	Xerus.
Pectinator.	Lycaon.	Hippopotamus.	Aulacodus.
	Zorilla.	Potamochœrus.	Oryoteropus.

Occurring also in the Indian Region.			Wide-ranging.
Viverra.	Elephas.	Scotophilus.	Felis.
Genetta.	‡Sus.	Miniopterus.	Canis.
Herpestes.	Asinus.	Taphozous.	Vespertilio.
Calogale.	Halicore.	Rhinopoma.	Vesperugo.
Mellivora.	Cynonycteris.	Nyctinomus.	Erinaceus.
Aonyx.	Cynopterus.	Crocidura.	Mus.
Hyæna.	Rhinolophus.	Acanthomys.	Dipus.
Bubalus.	Phillorhina.	Rhizomys.	Meriones.
Oryx.	Megaderma.	Hystrix.	Sciurus.
Gazella.	Nycteris.	Manis.	Lepus.

* Restricted to Abyssinia and Northeast Africa. † Restricted to Mozambique.

‡ See Rolleston, Trans. Linn. Soc. Lond., 2d ser., Zoöl., vol. i, pp. 256, 257, 1877.

The Southern Province.—The South African Province consists of only that small portion of the continent lying south of the Southern Tropic, and is hence situated wholly within the southern warm-temperate zone. In consequence of its configuration, its limited extension, and its geographical position in relation to Intertropical Africa, it could scarcely be expected to form more than an appendage of the intertropical zone, and such it proves really to be. Its area is equal to only about one-tenth of that of the Eastern Province, yet it has eight-ninths as many genera, fully two-thirds of which are common to the two. It hence presents to only a limited degree the features of a strictly temperate fauna, and these become prominent only over the narrow belt of country south of the mountain ranges forming the northern boundary of Cape Colony and Caffraria; but here even there is a strong invasion of essentially tropical forms.

In general *facies* it differs little zoölogically from the Eastern Province, of which it is merely a somewhat modified continuation. From its semi-temperate character it is less rich in Quadrumanes, but many other properly tropical types range nearly or quite to its southern border. It has, however, about one-fourth more peculiar genera, divided about equally, and mainly between Carnivores and Rodents, four only being Antelopes, and one only (*Chrysochloris*) an Insectivore. Of the twenty-four genera common also to the Indian Region, one-third are Chiropters. The remaining genera are, with very few exceptions, such as occur also in the Eastern Province, only three or four being common to the Southern and Western Provinces that do not also occur in the Eastern.

Of the eighty-two genera below enumerated as occurring in the Southern Province, a considerable portion are restricted to its southern half, while many others extend only over its northern portions. A few others, while mainly restricted to this region, and eminently characteristic of it, also extend somewhat into the Eastern Province.

Genera of the South African Province.

Restricted to the province.	Ranging into Tropical Africa.		Occurring also in the Indian Region.	
Ariela.	Galago.	Cephalophus.	Cyanælurus.	Miniopteris.
Cynictis.	Athylax.	Eleotragus.	Genetta.	Scotophilus.
Suricata.	Ichneumia.	Ægocerus.	Herpestes.	Taphosous.
Proteles.	Helogale.	Rhinaster.	Calogale.	Rhinopoma.
Megalotis.	Mungos.	Hyrax.	Mellivora.	Crocidura.
Hydrogale.	Lycaon.	Dendrohyrax.	Aonyx.	Hystrix.
Strepsiceros.	Zorilla.	Macroscelides.	Hyæna.	Manis.
Antidorcas.	Phacochœrus.	Steatomys.	Oryx.	
Scopophorus.	Giraffa.	Otomys.	Bubalus.	
Pelea.	Oreas.	Georychus.	Gazella.	
Chrysochloris.	Tragelaphus.	Graphiurus.	Asinus.	
Dendromys.	Damalis.	Xerus.	Elephas.	
Malacothrix.	Alcelaphus.	Aulacodus.	Cynonycteris.	
Mystromys.	Connochetes.	Orycteropus.	Cynopterus.	
Bathyergus.	Kobus.		Rhinolophus.	
Pedetes.	Æpyceros.		Phillorhina.	
Petromys.	Calotragus.		Nycteris.	
Wide-ranging.				
Felis.	Vespertilio.	Erinaceus.	Meriones.	Sciurus.
Canis.	Vesperugo.	Mus.	Dipus.	Lepus.

The Western Province.—As already stated, the Western Province differs greatly in respect to its physical characteristics from either of the other provinces of the African Region, and has, in consequence, a correspondingly specialized mammalian fauna. It resembles the Indian Region in its hot, damp climate and dense forests. And its fauna, though distinguished by many peculier genera, is also, in respect to its *general facies*, more like that of the Indian Region than is the fauna of any other portion of the African Region. It is similarly rich in the higher Quadrumanes and poor in Antelopes, while it shares with the

Indian Region the possession of the *Tragulidæ*. Its peculiar genera consist largely of Anthropoid Apes, found elsewhere only in India, but also includes several each of Carnivores Bats, and Rodents. It is pre-eminently the tropical province of the African Region. While it contains a smaller number of genera than either of the others, it has relatively a much larger number restricted to it, having eighteen peculiar genera out of a total number of seventy-five, while the Eastern Province, with ninety-one genera, has only twelve that are peculiar, and the Southern seventeen out of eighty-two.

Genera of the West African Province.

Restricted to the province.		Restricted to the African Region.		
Gorilla.	Cephalopus.	Cercopithecus.	Tragelaphus.	Rhinaster.
Mimetes.	Hyomoschus.	Cynocephalus.	Kobus.	Hyrax.
Miopithecus.	Chœropus.	Colobus.	Nanotragus.	Dendrohyrax.
Cercocebus.	* Manatus.	Guereza.	Ægocerus.	Epomophorus.
Arctocebus.	Hypsignathus.	Galago.	Damalis.	Xerus.
Perodicticus.	Potamogale.	Aythlax.	Oreas.	Aulacodus.
Poiana.	Lasiomys.	Mungos.	Hippopotamus.	Cricetomys.
Nandinia.	Anomalurus.	Zorilla.	Potamochœrus.	Graphiurus.
Adenota.		Crossarchus.	Phacochœrus.	
Occurring also in the Indian Region.				**Wide-ranging.**
Viverra.	Zorilla.	Phillorhina.	Crocidura.	Felis.
Herpestes.	Bubalus.	Nycteris.	Atherura.	Canis.
Genetta.	Antilope.	Nyctinomus.	Manis.	Vespertilio.
Calogale.	Elephas.	Miniopterus.		Vesperugo.
Hyæna.	Cynonycteris.	Scotophilus.		Mus.
Aonyx.	Cynopterus.	Taphozous.		Sciurus.
Mellivora.	Rhinolophus.	Rhinopoma.		Lepus.

* Also American.

General Summary.

The number of genera represented in the African Region, and their range, is approximately as follows:—

	Eastern Province.	Southern Province.	Western Province.
Peculiar genera	12	17	18
Restricted to the African Region, but occurring more or less generally over two or more of the provinces	39	31	26
Occurring also in the Indian Region	30	24	24
Wide-ranging	10	10	7
Whole number	91	82	75

Indian Region.—The Indian Region may be defined, in general terms, as consisting of Intertropical Asia. It hence embraces Continental India from the Lower Indus to the Formosa Straits, the islands of the Indian Archipelago, as well as Formosa, the Philippines, Celebes, and all of the Sunda Islands. As far as the mammalia are concerned, only two primary subdivisions, or provinces, seem to be recognizable, the one a Northern, or Continental, the other a Southern, or Insular ("Malayan"). The former, or Continental, includes nearly all of the Hindostan and Indo-Chinese Peninsulas, excepting the extreme southern border of the latter and Malacca. These areas belong to the Insular Province, which comprises not only Borneo, Sumatra, and Java, but all of the above-named smaller islands to the eastward, except Formosa, which pertains to the Continental Province.

The long, narrow Malaccan Peninsula is almost insular in position and character, and agrees far better, climatologically, and in its productions, with Borneo and Sumatra, than with the mainland to the northward, as does, in fact, the extreme coast border of the mainland, embracing Lower Cochin China, Cambodia, etc. The small outlying islands to the eastward have nothing in common with the Australian Realm (if we exclude the wide-ranging *Chiroptera* and a few marine forms, which are, of all mammals, of least importance in a zoögeographical point of view), except the single Marsupial genus *Cuscus* occurring in Timor and Celebes, while no placental mammals except *Sus*, a few Murine genera, the Dugong, and *Chiroptera*, reach any portion of the Australian Realm. Malacca, Borneo, and Sumatra form the central and typical portion of the Insular or Malayan Province, being, from their larger area and closer proximity to each other and to the tropical mainland, far richer in genera and species than the smaller and more remote islands to the southward and eastward. Even Java has a less varied mammalian fauna than either Borneo or Sumatra, and thus differs from them negatively rather than by the possession of peculiar types. Thence eastward, throughout the Sunda Islands, the differences are almost wholly such as result from the small size and isolated position of these insular areas, through a gradual disappearance of many types present in the larger islands. The Philippines, for similar reasons, lack a large proportion of the genera found in the central portion of the province, while those they do possess, with few exceptions, are such as are common to the larger areas. The few that are peculiar are Indian, rather than Australian, in their affinities.

Celebes and Timor contain one strictly Australian genus (*Cuscus*, represented by several species), but the few other mammals found there are either Indian or possess strictly Indian or Indo-African affinities. Hence I fail to see any good reason for assigning Celebes and all the smaller Sunda Islands to the Papuan Province, as Mr. Wallace and others have done, but abundant evidence that such is not their real affinity. Even Mr. Wallace's own tables of distribution show at a glance the wide disassociation of these islands from the Papuan fauna, and their much nearer relation to the Indian, there being but one typically Australian or Papuan form represented in any of them, while none of the placental land mammals (excepting several subtropicopolitan genera of Bats and a few Muriform Rodents) are common to these islands and the Papuan-Australian division. The genera peculiar to the Philippines and Celebes (except *Cuscus* in the latter) have little if any more significance than the occurrence in Borneo and Sumatra of a few genera wholly restricted to one or the other of these last-named islands.

Ceylon and the adjoining low-coast portions of the Hindostan Peninsula are more tropical in character than the plateau region to the northward. While a few genera are restricted to this small area, and many more species occur here that are not found to the northward, the differentiation seems hardly great enough to warrant the separation of these areas as a region of co-ordinate rank with the "Malayan". It hence seems to me that Mr. Wallace has too emphatically recognized this comparatively unimportant difference in making it the basis of a distinct subregion (termed by him the "Ceylonese Subregion"). The only mammalian genera peculiar to this division are a genus of Lemurs (*Loris*), three genera (or subgenera) of *Herpestinæ* (*Calictis*, *Tæniogale*, *Onychogale*), and a genus of Mice (*Platacanthomys*), each represented by a single species, and, so far as known, of limited distribution.

Continental Province.—As already intimated, the Continental Province includes nearly all of Hindostan and Indo-China, or the whole of the tropical portion of the Asiatic continent excepting Malacca and the southern portions of Tenasserim, Siam, Cambodia, and Cochin China. It also extends into Southern China somewhat beyond the tropic (probably to the divide between the Li-kiang and Yang-tse-kiang Rivers), and also to the southern slope of the Himalayas.*

The plains of the Upper Indus appear, however, to belong to the Temperate Region to the northward, as does probably most of the country northwest of Delhi. The greater part of the interior of the Hindostan Peninsula has a less tropical character and a less varied fauna than Bengal, Assam, and Burmah, situated under the same parallels. I cannot agree, however, with Messrs. Blyth, Blandford, and von Pelzeln,†

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*"On the southern slope of the Himalayas there is everywhere, until it has been cleared, luxuriant forest up to at least 12,000 feet above the sea, inhabited by a fauna which extends, without any great change of generic forms, throughout the Malay Peninsula and into the hill tracts of some at least of the Malay Islands."—BLANDFORD, *Proc. Zoöl. Soc. Lond.*, 1876, p. 632.

†Mr. Blyth makes "Hindostân proper, or the plains of Upper India east and south of the North West desert; Dukhun, or tableland of the Peninsula of India, and the intervening territory, inclusive of the Vindhaian ghâts; Coromandel Coast and low northern half of Ceylon" a subregion of his "Ethiopian Region" (Nature, vol. iii, p. 428). Mr. Blandford holds that the "hills of Southern India with the Malabar Coast and Southern Ceylon form a province of the Malay region, *whilst the greater* portion of the Indian peninsula is African in its affinities" (Proc. Zoöl. Soc. Lond., 1876, p. 632). Von Pelzeln considers India proper, from the Lower Brahmaputra River westward, a distinct primary region, which he calls the "hindostanische Region". His "malayische Region" hence consists of Warm-temperate and Tropical Asia, minus the Hindostan Peninsula, to which he adds the Philippines, Borneo, Bali, Java, and Sumatra. It includes China as far as the Yang-tse-kiang River, and the Himalayan plateau from

that the larger part of Hindostan should be joined to the African Region rather than the Indian, since only a very few African genera occur here that do not also range far to the eastward, or almost throughout the Indian Region. According to von Pelzeln,[*] about one-third of the genera of the "hindostanischen Fauna" are peculiar to it, while it shares almost another third with Indo-China. The remaining third (fourteen genera) are common to the African Region, *but all except four of them occur also more or less generally over the Indian Region.* Of these, two (*Hyæna* and "Ratelus" = *Mellivora*) scarcely reach the limits of the Indian Region as here defined. Among the genera given by him as peculiar are, however, several that range beyond the Indian Peninsula.

There is more reason for Mr. Wallace's separation of the Hindostan Peninsula from the Indo-Chinese portion of the Indian Region, and its subdivision into two "subregions"—a northern "Hindostan Subregion" and a southern "Ceylonese Subregion". As already shown, the latter has a number of peculiar forms, while three or four genera are also peculiar to the Hindostan Peninsula at large. But the scale of division that would make the Hindostan Peninsula separable into two subregions would also require a somewhat similar subdivision of Indo-China, making four divisions of what I here term the Continental Province. While these divisions would have some natural basis, they are too detailed to come into the category of divisions for which I adopt the term "province".

Continental Province.—The Continental Province, with the limitations here assumed, is nearly equivalent to Mr. Wallace's three "subregions", termed respectively "Hindostan", "Ceylonese", and "Indo-Chinese". Of about ninety-four genera represented in it, about two-thirds have a pretty general range throughout the province, while only about one-eighth are limited to the Hindostanese portion, including those already named as almost peculiar to Ceylon and the low coast region east of the Eastern Ghâts. Excluding about a dozen that range over at least half the surface of the globe, one-third of the remainder (more than one-fourth of the whole) are common to the African Region; more than one-half (almost one-half of the whole) are restricted to the Indian Region and a little more than one-fifth (about one-eighth of all) are peculiar to the province. This shows, as already noted in discussing the fauna

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Burmah, Assam, and Bengal to the Kuenluen Mountains, thus embracing Nepal, Butan, and Thibet. It is divided into five subregions, the two northernmost of which belong mainly to the North Temperate Realm. (Festschrift z. Feier des fünfundzwanzigjährigen Bestehens d. K.-K. Zool.-Bot. Gesells. in Wien, 1876, pp. 53–74 u. Karte.) The fauna of the Thibetan plateau, as claimed by Mr. Blandford, being boreal and alpine, and having almost nothing in common with the tropical region to the southward, the artificial charactor of von Pelzeln's "subregions" is shown by his assuming the Yang-tse-kiang River to be a natural boundary between two primary regions, and his separation of Malacca from Sumatra and Borneo to form a part of his "hinter-indische Unterabtheilung", which thus consists of the whole of the Indo-Chinese Peninsula down to the very southern extremity of Malacca!

[*] Verhandl. d. K.-K. Zool.-Bot. Gesells. in Wien, xxv. Bd., p. 57, 1875.

of the Indo-African Realm, how strong an affinity exists between the African and Indian Regions, two-fifths of all the genera of the Indian Region which have an extralimital range occurring also in the African Region. The close affinity of the two provinces of the Indian Region is shown by the fact that two-thirds of the peculiar Indian genera found in the Northern or Continental division range also into the Southern or Insular. As will be shown later, the Insular Province is the more highly specialized of the two divisions.

Genera of the Continental Province.

Restricted to the Indian Region.				
Restricted to the province.		Occurring also in the Insular Province.		
Rhinopithecus.	³Tetracerus.	Hylobates.	Gymnopus.	Tragulus.
¹Loris.	Porcula.	Semnopithecus.	Helictis.	Rhinoceros.
²Urva.	Eonycteris.	Macacus.	Mydaus.	Pteropus.
¹Tæniogale.	Cœlops.	Nycticebus.	Cuon.	Macroglossus.
¹Calictis.	Nesokia.	Viverricula.	Bibos.	Harpiocephalus.
¹Onychogale.	Neodon.	Arctitis.	Rusa.	Tupaia.
Melursus.	¹Platycanthomys.	Prionodon.	Rucervus.	Pteromys.
²Tragops.		Paguma.	Axis.	Spalacopus.
³Portax.		Paradoxurus.	Cervulus.	Acanthion.
Of wide extralimital range.				
Ranging into the African Region.		**Ranging into the Europæo-Asiatic Region.**		**Subcosmopolite.**
Viverra.	⁴Miniopterus.	⁵Putorius.	⁶Sus.	Felis.
Herpestes.	Taphozous.	²Ælurus.	⁶Rhinolophus.	Canis.
Aonyx.	Rhinopoma.	Arctonyx.	⁶Erinaceus.	Vulpes.
Bubalus.	⁴Nyctinomus.	⁵Ursus.	Talpa.	Mustela.
Halicore.	Crocidura.	Bos.	⁵Sorex.	Lutra.
Elephas.	Rhizomys.	Nemorhædus.	⁵Sciuropterus.	Vespertilio.
Cynopterus.	Gerbillus.	Capra.		Vesperugo.
Cynonycteris.	Meriones.	Gazella.		Sciurus.
Phillorhina.	Acanthomys.	Procapra.		Mus.
⁴Megaderma.	Hystrix.	⁵Cervus.		Lepus.
Scotophilus.	Atherura.	Hydropotes.		
Kerivoula.	Manis.	Moschus.		

¹Restricted to Ceylon and Southern Hindostan.
²Restricted to the northern part.
³Hindostan generally.
⁴Also tropics of America.
⁵Whole northern hemisphere.
⁶Also African.

Summary.

Whole number	94
Restricted to the Indian Region	43
Restricted (almost wholly) to the province	16
Other genera ranging over most of the Indian Region and restricted to it	27
Common to the African Region	28
Common to portions of the Europæo-Asiatic Region	34
Ranging over most of the northern hemisphere	17
Nearly cosmopolite	10
Restricted to Southern Hindostan and Ceylon	5

Insular or "Malayan" Province.—The northern boundary of the Insular Province is not at present easily determinable, but it is quite evident that, as already stated, the southern maritime portions of Indo-China belong here rather than with the northern division of the Indian Region. To the southward and eastward it embraces, as already explained, the Sunda Islands, the Philippines, and Celebes. Of the eighty-three genera occurring in it, twenty-five, or nearly one fourth, are peculiar, while twenty-seven others do not range beyond the Indian Province. Twenty of the remainder are properly Indo-African genera, while about a dozen others have a wide extralimital range, and about the same number have a very local range, the larger islands having each one or two peculiar genera. Aside from several tropicopolitan genera of Bats, and the wide-ranging genera *Sus* and *Mus*, only one genus is properly Australian, and this is a straggler that merely reaches Timor and Celebes. As would be expected, the larger central islands, together with Malacca and the mainland belt, possess the richest and most varied fauna, the smaller outlying islands presenting a paucity of types proportionate to their size and isolation.

Timor, considering its close proximity to Australia, is remarkably free from Australian forms, presenting, in common with Celebes, the single Marsupial genus *Cuscus*. The distribution of the genera of this province is roughly indicated in the subjoined table. Notwithstanding its much smaller land-area, and the fact that it has ten less genera than the Continental Province, it has, as would be naturally expected, many more peculiar genera,* the ratio of peculiar genera in the one being as 16 to 94, and in the other as 25 to 83.

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* Four, however, are peculiar only in regard to the Indian Region, they being simply wide-ranging tropical forms that are unrepresented in the Continental Province.

Genera of the Insular Province.

Restricted to the Indian Region.			
Restricted to the province.		Ranging over much of the Continental Province.	
Simia.	[6] Megærops.	Hylobates.	Rusa.
Simianga.	[3] Harpyia.	Semnopithecus.	Rucervus.
[1] Nasalis.	[4] Phyllotis.	Macacus.	Axis.
[3] Cynopithecus.	Chiromeles.	Nycticebus.	Cervulus.
Tarsius.	[8] Emballonura.	Viverricula.	Tragulus.
Hemigalea.	Hylomys.	Arctitis.	Rhinoceros.
Arctogale.	[1] Ptilocerus.	Prionodon.	[8] Pteropus.
[2] Cynogale.	Gymnura.	Paguma.	[8] Macroglossus.
[6] Barangia.	[4] Phlæomys.	Paradoxurus.	[8] Harpiocephalus.
Helarctos.	Rhinosciurus.	Gymnopus.	Tupaia.
[5] Anoa.	[5] Cuscus.	Helictis.	Pteromys.
[5] Babirusa.		Mydaus.	Spalacopus.
[9] Tapirus.		Cuon.	Acanthion.
Galeopithecus.		Bibos.	

Ranging into Africa and elsewhere.		
African.		Wide-ranging.
Viverra.	[7] Nycteris.	Felis.
Herpestes.	[8] Scotophilus.	Canis.
Aonyx.	[8] Kerivoula.	Mustela.
Bubalus.	[8] Miniopterus.	Lutra.
Sus.	[8] Taphozous.	Rhinolophus.
Elephas.	[8] Nyctinomus.[9]	Vespertilio.
Halicore.	Crocidura.	Vesperugo.
[8] Cynopterus.	Rhizomys.	Sorex.
[8] Cynonycteris.	Manis.	Mus.
[8] Phyllorhina.		Sciurus.
Megaderma.		Sciuropterus.

[1] Borneo only.
[2] Borneo and Sumatra.
[3] Philippines and Celebes.
[4] Philippines only.
[5] Celebes; *Cuscus* also in Timor and the Papuan region.
[6] Sumatra only.
[7] Java only.
[8] Tropics of the Old World generally.
[9] Also American tropics.

Summary.

Total number of genera	83
Restricted to the province*	25
Restricted to the Indian Region	52
Found outside of the Indian Region in the African only	20
Common to the African and Indian Regions	29
Wide-ranging (exclusive of tropicopolitan)	12
Of local distribution	12
Restricted to Borneo	2
Restricted to Borneo and Sumatra	1

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* Exclusive of several tropicopolitan genera not occurring elsewhere in the Indian Region.

Restricted to Sumatra	2
Restricted to Java	1
Restricted to the Philippines	2
Restricted to the Philippines and Celebes	1
Occurring only in Celebes	2
Non-placental genera	1

VI.—AUSTRALIAN REALM.

The Australian Realm will be here restricted so as to embrace none of the islands situated to the westward of the Moluccas. The Molucca Group forms a transitional link between the Indo-African and the Australian Realm, but they are faunally more closely allied to the latter than to the former. These islands embrace, excluding *Chiroptera* and species probably or known to have been introduced by man,* only a single genus (*Sorex*) of Placental Mammals, while two genera of Papuan Marsupials (*Cuscus* and *Belideus*) are abundantly represented.

The Australian Realm, considered as a whole, is made up of very heterogeneous elements, its land-surface consisting of islands, many of them of small size and widely scattered. The mammals are almost wholly limited to its three larger constituents,—Australia, Tasmania, and New Guinea,—and a few of the larger islands in close proximity to them. Among the prominent types very generally represented throughout all of these areas are several wide-ranging (almost tropicopolitan) genera of Bats, which, in consequence of their wide geographical range, wholly fail to be distinctive, and may hence be safely ignored in the following general analysis of the region. The marine species (the Dugong and various species of Seals) are likewise of small importance in the present connection, since they are all wide-ranging species, not properly characteristic of the region. After these eliminations, we have left a few genera of *Muridæ* and the distinctively characteristic implacental mammalia. The latter, with the exception of a single family (*Didelphidæ*, occurring now only in the warmer parts of the two Americas), are found nowhere else, and hence give to the region an exceptional distinctness as a primary zoögeographical region. The numerous groups of small, widely scattered islands, usually considered as collectively forming the Polynesian Region, being destitute of mammalia, need not be here further considered.

New Zealand, situated more than a thousand miles to the southeastward of Australia (its nearest large land-area), is also wholly deficient in characteristic forms of mammalia; the only representatives of this class, aside from Seals and Bats, being a Rodent, supposed, rather than certainly known, to be found there. The Seals are wide-ranging species, and of the two species of Bats, one has Australian and the other South

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* These include, besides the common domestic species, *Cynopithecus nigrescens*, *Viverra tangalunga*, *Babirusa alfurus*, and *Cervus hippelaphus* var. *moluccensis*, considered by Mr. Wallace as "probably" or "almost certainly" introduced by man, since they are species "habitually domesticated and kept in confinement by the Malays".—*Geogr. Dist. Anim.*, vol. i, p. 417.

American affinities. Judged by other classes of animals, the fauna of New Zealand is Australian (or Australian and Polynesian), but is yet so specialized that the New Zealand islands must be recognized as forming a distinct and highly differentiated region (New Zealand Region) of the Australian Realm.

As regards mammalia (and the same is true of the fauna and flora considered collectively), Tasmania, Australia, and New Guinea have many features in common, fully one-half of the genera (seven out of fourteen) of mammals occurring in Tasmania being represented not only throughout the greater part of Australia, *but also in New Guinea.*

Tasmania and New Guinea are less rich in mammalia than Australia, but this is obviously due to their insular character and small area. Tasmania is scarcely more closely related to Southern Australia than New Guinea is to Northern Australia. Formerly, New Guinea was thought to be very distinct from Australia, but the recent exploration of the interior of New Guinea by MM. Beccari, d'Albertis, and Laglaize, has brought to light the existence there of many forms before supposed to be restricted to Australia and Tasmania. M. Alphonse Milne-Edwards, in a recent communication to the French Academy respecting some new species of mammalia discovered in New Guinea by M. Laglaize, in referring to the close relationship existing between the faunæ of New Guinea and Australia, thus observes:—"Plus on étudie la faune de la Nouvelle-Guinée, plus on lui trouve de ressemblance avec celle de l'Australie, et les indications fournies par la répartition des espèces animales permet d'affirmer qu'autrefois ces terres ne formaient qu'un seul grand continent. Déjà les résultats des voyages de circumnavigation entrepris dans la première moitié de ce siècle . . . avaient permis de soupçonner cette conformité d'origine; mais elle a été principalement mise en lumière à la suite des explorations de M. Wallace, de M. Beccari et de M. d'Albertis. Enfin les collections qui M. Laglaize a formées dans ces régions, ainsi que celles qui lui ont été remises par M. Bruijn et qui viennent d'arriver en France, fournissent des faits nouveaux qui accentuent encore les ressemblances entrevues."*

Formerly the Monotremes were supposed to be restricted to the southern half of Australia and Tasmania, but within the last two or three years the existence of *Tachyglossus* in North Australia (latitude 21°) has been established, and an allied species has been discovered in the mountains of New Guinea. M. A. Milne-Edwards has also just described a species of *Dromicia* from New Guinea, and also a species of *Hapalotis*, and Dr. Peters has recently added species of *Phalangista*, *Chætocercus*, and *Hydromys*, making six genera recently discovered in New Guinea that were previously known only from Australia and Tasmania.

So far as at present known, only three or four genera (*Uromys*, *Dendrolagus*, *Dorcopis*, and *Myœctis*) of mammals are peculiar to New Guinea and the small islands situated between New Guinea and Australia, and probably some of these will yet be found in Australia. One of these (*Myœctis*) has been thus far reported only from the Aru Islands. As Tasmania has two peculiar genera (*Thylacinus* and *Sarcophilus*), New Guinea, in view of its four or five times greater area, is in reality scarcely more specialized than is Tasmania, and is hence faunally as much a part of Australia as is the latter. As will be shown later, nearly as many of the genera occurring in Southern Australia have been found in New Guinea as in Tasmania. Scarcely two years ago Mr. Wallace stated that "as yet no other [referring to the genus *Sus*] non-marsupial terrestrial mammal has been discovered [in "Papua, or the New Guinea Group"] except a Rat, described by Dr. Gray as *Uromys aruensis*, but about the locality of which there seems some doubt."* This genus has not only now been established as occurring there, but four additional species of it have been described by Dr. Peters, who has also added a species of *Hydromys*, and Mr. Alston has added a species of *Mus* and M. A. Milne-Edwards a species of *Hapalotis*, in all seven species, belonging either to Australian genera or having decided Australian affinities.

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*Compte-rendu, tom. lxxxv, 1079, déc. 3, 1877.

Regions of the Australian Realm.—Accepting the Polynesian Islands as forming one region (the Polynesian), and New Zealand as constituting another (the New Zealand), we have left for detailed consideration only the larger land-masses, consisting of Tasmania, Australia, and New Guinea with its associated islands, forming the third or Australian. The close zoölogical affinity of Tasmania and Australia no one questions, and it has been already shown that New Guinea and Australia are almost equally inseparable. Although many genera range from Tasmania across Australia into New Guinea, this large area, embracing as it does nearly fifty degrees of latitude, falls naturally into two well-marked subdivisions, the one tropical the other temperate.† These

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* Geogr. Distr. Anim., vol. i, pp. 409, 410.

† In 1871, in referring to the Australian Realm (Bull. Mus. Comp. Zoöl., vol. ii, p. 381), I said:—"It is divisible into a Temperate and a Tropical Region, the former embracing New Zealand and Australia." The latter portion of this statement was of course made without due consideration. As already stated, New Zealand has no intimate relationship with Australia, and should be treated as a separate and independent region of the Australian Realm. Mr. Wallace, in stating his "Objections to the System of Circumpolar Zones" (Geogr. Distr. Anim., vol. i, p. 67), has very naturally taken notice of this unfortunate slip, and cites it as evidence of the "erroneous results" that follow from the adoption of the principle of the "distribution of life in circumpolar zones". My "separation of New Zealand to unite it with the southern third of Australia" was certainly most thoroughly erroneous; but while, as Mr. Wallace says, the fauna of Australia, taken as a whole, is exceptionally homogeneous, I cannot agree with him that New Guinea, so far at least as its mammalian fauna is concerned, is "as sharply differentiated from Australia as any adjacent parts of the same primary zoölogical region can possibly be"—in other words, that it can be only arbitrarily joined with the northern portion of Australia. I freely admit that I was not only in error as regards New Zealand, but also in respect to my division of the Australian continent, and I accept this portion of Mr. Wallace's criticism as fairly made. That the error was not one of "principle", but merely a wrong application of a principle, I think the text

I consider, so closely are they related, rather as provinces than regions, and may be termed respectively the Papuan Province and the Australian Province. The former is situated almost wholly between the equator and the twentieth degree of south latitude. The latter embraces that portion of Australia south of this line, together with Tasmania. The boundary between the two regions can of course be drawn only approximately, but may be provisionally assumed as the vicinity of the isotherm of 70° F.* The reason for uniting the northern portion of Australia with New Guinea as a part of the Papuan Province lies in the fact that not only so many of the mammalian genera are common to the two, but that these genera are absent from the more southern portions of Australia, where they are replaced by others wholly restricted to South Australia and Tasmania. Three-fourths of all the genera of Marsupials (excluding, of course, the American family *Didelphidæ*) are, so far as at present known, restricted to the Australian Province, as are several genera of *Muridæ* and the *Ornithorhynchus*. Of the remaining Marsupial genera, six only are limited to the Papuan Province.

The Papuan Province.—The Papuan Province embraces not only New Guinea, but the Molucca and Aru Islands on the west and the Solomon

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here following sufficiently shows. The principle I still hold as applying to Australia with the same force as elsewhere, only I make the division more to the northward, as a little more care would have led me to do originally. The York Peninsula, and most probably the whole northern coast region north of 20° S. lat. (except the high arid interior), has certainly closer affinities, as regards mammals, with New Guinea than it has with any portion of South Australia. Of the strictly Papuan genera, only two out of nine are restricted to New Guinea, the rest being common to both North Australia and Papua. Of the other North Australian genera, about one-half occur generally throughout the continent, but the remainder are essentially South Australian, represented by only stragglers in Northern Australia. On the other hand, more than twenty genera occurring in Southern Australia and Tasmania, are wholly unrepresented in the portion of Australia I here assign to the Papuan Region. In other words, we get the same wide faunal differences between the tropical and temperate portions of the Australian Realm that we get elsewhere under similar climatic conditions.

In the same connection, Mr. Wallace cites my separation of Temperate South Africa as a primary region as another instance of the misleading nature of the principle of the distribution of life in zones. This I have also seen fit to abandon (see *antea*, p. 351) on a detailed re-examination of the subject, not because the principle is erroneous, but in consequence of certain peculiar geographical conditions, namely, the comparatively small area subject to a temperate climate and to its limited extension into the temperate region. It is, in fact, wholly within the warm-temperate belt, and widens rapidly northward to abut very broadly against the tropical zone. Only a very small portion really comes under the influence of temperate conditions. Here we get, as usual, a temperate aspect in the fauna, and I still maintain my separation of South Africa as a faunal division, simply lowering its grade from a primary region to a "province" of the great Indo-African Realm, simply from the fact that the smallness of its area and warm-temperate, rather than temperate, conditions have prevented, as would be naturally expected, any great amount of differentiation.

* Mr. E. Blyth, in a paper (Nature, vol. iii, p. 428, issue of March 30, 1871) published almost simultaneously with my own cited in the last foot-note, included a portion of Northern Australia in his "Papuan Sub-region", namely, "York Peninsula and eastern half of Queensland (as far as the dividing range), on the main land of Australia".

Group on the east, as well as the most northerly portion of Australia, including the York Peninsula, and probably the whole northern coast region, or that portion of Australia north of the Southern Tropic, except the elevated arid interior. Of the twenty-seven genera (exclusive of *Chiroptera* and marine species) represented in the Papuan Province, ten are not found elsewhere in the Australian Realm. Three of these (*Sus*, *Sorex*, found only in the Moluccas, and *Mus*) have a wide Indo-African range; four (*Uromys*, *Dendrolagus*, *Dorcopsis*, and *Myœctis*) are found only in New Guinea and the Aru Islands; and one (*Dactylospila*) in the Aru Islands and the York Peninsula.

The seventeen remaining genera belong more properly to the Australian Province, or perhaps to Australia at large. Many of them, while numerous in species, have here (like *Halmaturus*, *Antechinus*, *Podabrus*, *Mus*, *Hapalotis*, etc.) only straggling representatives, but are numerously represented in the temperate region to the southward. The distribution of the genera is approximately indicated in the subjoined table.

Genera of the Papuan Province.

[NOTE.—The New Guinea representatives of the genera *Hapalotis*, *Phalangista*, and *Tachyglossus* have recently been separated from their Australian affines as distinct subgenera. *Babirusa* is also reported from Bouru, but as probably introduced from Celebes.]

Restricted to New Guinea and neighboring islands.	Restricted to New Guinea and North Australia.	Also ranging over most of the Australian Region.		
Sus.[1]	Acanthomys.[3]	*Mus.	Halmaturus.[6]	Petrogala.
Sorex.[2]	Phascogale.	*Hapalotis.[6]	*Perameles.[6]	*Phalangista.[6]
Uromys.	Cuscus.[4]	*Hydromys.[6]	Macropus.[6]	*Belideus.[6]
Dendrolagus.	Dactylopsila.[5]	Dasyurus.[6]	Osphranter.	*Dromicia.[6]
Dorcopsis.		*Antechinus.[6]	Onychogalea.	*Tachyglossus.
Myœctis.		*Chætocercus.	Largorchestes.	

[1] New Guinea only.
[2] Moluccas only.
[3] North Australia only.
[4] Also Celebes, Timor, and Moluccas.
[5] Aru Islands, New Guinea (*Peters*), and York Peninsula (*Krefft*).
[6] Mainly large South Australian genera, sparingly represented in North Australia and New Guinea.
*Occurring in New Guinea.

Summary.

Total number of genera	27
Restricted to the region (including, however, two Indo-African genera)	10
Represented in New Guinea	18
Ranging also over the Australian Region	16
Restricted to New Guinea and neighboring islands (exclusive of two Indo-African genera)	4
Common to only New Guinea and North Australia	4
Genera properly belonging to the Australian Region, but sparingly represented in the Papuan Region	10
Distinctively characteristic of the Papuan Region, about	15

Australian Province.—The Australian Province, embracing Tasmania and all of Australia south of about the southern isotherm of 70° F., contains not less than fifteen to eighteen genera, out of a total number of thirty-four that are restricted to this region, while of the remainder much more than one-half have their chief development here. One-third of the whole are represented in Tasmania, and nearly one-fourth range into New Guinea. Two only are peculiar to Tasmania. The distribution of the genera is shown somewhat in detail in the subjoined table.

In this connection it may be added that the close affinity of the Papuan fauna with that of Australia is sufficiently evinced by the fact that of the thirty-four genera represented in South Australia nine range into New Guinea—nearly as many as occur in Tasmania!

Genera of the Australian Province.

Restricted to Temperate Australia and Tasmania.		Occurring also in the Papuan Region.	
Pseudomys.	Æpyprymnus.	*Mus.	[3]Halmaturus.[2]
Echiothrix.	Bettongia.[2]	*Hapalotis.[3]	Petrogale.
*Antechinus.[3]	Hypsiprymnus.[2]	*Hydromys.[3]	Onychogale.
Antechinomys.	Phalascolarctos.	*Chætocercus.	Largorchestes.
Sarcophilus.[1]	Petaurista.	*Dasyurus.[3]	*[3]Phalangista.[2]
Thalacinus.[1]	Acrobata.	*[3]Perameles.[2]	*[3]Dromicia [2]
Podabrus.	Tarsipes.	[3]Macropus.[2]	*Belideus.[3]
Myrmecobius.	Phascolomys.[2]	Osphranter.	*Tachyglossus.[2]
Chæropus.	Ornithorhynchus.[2]		

[1]Restricted to Tasmania. [2]Represented in Tasmania. [3]Mainly restricted to the Papuan Region.
*Occurring in New Guinea.

Summary.

Total number of genera	34
Restricted to the Australian Region	18
Occurring also in the Papuan Region	16
Represented in Tasmania	12
Represented in New Guinea	10
Restricted to Tasmania	2

VII.—LEMURIAN REALM.

As was long since claimed by Dr. Sclater,[*] Madagascar is faunally so distinct from every other ontological division of the globe as to be entitled to the rank of a primary zoögeographical region. With it, as is generally admitted, should be associated the Mascarene Islands. The very few mammals indigenous to these islands are decidedly Madagascarene in their affinities, as are the birds and other land animals. While the Lemurian fauna shows decided African affinities, it is second only to the Australian in its degree of specialization. It departs most strikingly from all other regions in what it lacks, through the absence of all Carnivores save one peculiar family (*Cryptoproctidæ*), represented by a single species, and four peculiar genera of the family *Viverridæ;* of all Ruminants and Proboscidians; all Pachyderms except a single African genus of *Suidæ;* and all Rodents except a few species of *Muridæ.* The Insectivores are almost wholly represented by one or two species of *Crocidura*, and a family, embracing several genera, not found elsewhere, save a single genus in the West Indies. Four families of Bats occur, but are represented, with one exception, each by a single species. They belong to groups of semi-cosmopolitan range, and owing also to the exceptional means of dispersal possessed by the *Chiroptera*, have little weight in determining the affinities of the fauna. The Quadrumanes are represented only by the *Prosimiæ*, of which three-fourths of all the species occur here, while about four-fifths of the remainder are African. The remains of an extinct species of *Hippopotamus* have been found, a type existing at present only in Africa. Although the Indian genus *Viverricula* has recently been established as occurring in Madagascar, the few types that connect the Lemurian mammalian fauna with the faunæ of other parts of the world are preponderatingly African.

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[*] Quarterly Journ. Sci., vol. i, April, 1864, pp. 213–219.

With the exception of the Bats, which, for reasons already given, are scarcely entitled to consideration in the present connection, the mammalia of "Lemuria" are, generally speaking, the lowest existing representatives of their respective orders. The most prominent type, embracing, in fact, about three-fifths of all the species (excluding the half dozen species of *Chiroptera*), belong to the *Prosimiæ*, the lowest of the Quadrumanes, which in early Tertiary times had representatives over a large part of the northern hemisphere, and perhaps had at that time a nearly cosmopolitan distribution. The Carnivores are likewise allied to early types of the *Viverridæ*, which formerly had a much wider range than at present; and the Insectivores are also of low forms, and allied to early types. These facts seem, at first sight, to lend support to the hypothesis, first advanced by Dr. Sclater, that Madagascar and the Mascarene Islands are but remnants of a former extensive land-area that possibly had connection with America as well as India, and embraced portions of Africa. The supposed former relationship with America is indicated perhaps not so much by the presence of *Solenodon* in the West Indies, and of American forms of Serpents, Lizards, and Insects in Madagascar, as by the abundant occurrence of Lemuroid remains in the North American Eocene. Since, however, these early Lemuroid forms appear not to have been true Lemurs, but a more generalized type, having affinities also with the Carnivores and Insectivores, and since they occurred also in Europe, and probably in Asia (for recent palæontological discoveries in our American Tertiaries show that much may be expected from future explorations elsewhere), it is possible that the explanation of the present distribution of the *Prosimiæ* needs not the supposition of the existence of any very extensive land-area that has since disappeared: in other words, that the African and Madagascarene *Lemuridæ* may have reached their present homes by migration from the northward (leaving a remnant in India), at a time when North America and Asia formed a continuous land-area, just as there is good reason for believing that the greater part of the present faunæ of India, Southern Europe, and Africa are a comparatively recent immigration from the northward; that Madagascar derived, at a comparatively early period, its existing fauna from Africa, as Mr. Wallace believes to have been the fact; and, finally, that at a time antedating the appearance of the present African fauna, Madagascar was actually united to the African continent.* America is now not only currently considered to be the "Old World" geologically, but it seems probable, as has recently been suggested,† that the Equine, Tapiroid, Rhinoceroid, Cameloid, Suilline, and Cervine forms, the *Prosimiæ*, and possibly the Proboscidians, Marsupials, and Edentates, were either first developed in America, or had their origin there in early generalized forms, and have since spread to the more recently formed continents of the eastern hemisphere. Many of them, as well as other early, generalized types, are known to have had a nearly contemporaneous existence during the early part of the Tertiary period both in America and Europe. This certainly lends probability to Mr. Wallace's hypothesis respecting the origin of the present Lemurian fauna.

The families and genera represented in "Lemuria", their faunal alliances, and areas of chief distribution, are as follows:—

LEMURIDÆ.—Chiefly developed in Madagascar, but occurring in Tropical Africa, Southern India, and the Malay Archipelago. Represented by about twelve genera and about fifty species, three-fifths of which are peculiar to Madagascar, and three-fourths of the remainder to Africa. Genera:—*Indris, Propithecus, Lemur, Hapalemur, Microcebus, Lepilemur, Chirogaleus.*

DAUBENTONIIDÆ.—Peculiar to Madagascar and represented by a single species—*Daubentonia* (=*Chiromys*) *madagascariensis.*

CRYPTOPROCTIDÆ.—One species (*Cryptoprocta ferox*), found only in Madagascar.

VIVERRIDÆ.—Warmer parts of Asia, the Malayan Islands, and Africa. Represented in Madagascar by several peculiar genera and the Indian genus *Viverricula.* Genera:—*Fossa, Galidia, Galidictis, Viverricula.* Species of the African genus *Herpestes* also reported.

EUPLERIDÆ.—Peculiar to Madagascar, and embracing the single genus *Eupleres.*

SUIDÆ.—Eastern hemisphere generally. Represented in Madagascar by species of the African genus *Potamochœrus.*

HIPPOPOTAMIDÆ.—African. Represented in Madagascar by the remains of a species believed to have but recently become extinct.

PTEROPIDÆ.—The tropics everywhere, except Tropical America. Represented in Madagascar and the Mascarene Islands by two species of the Indian and Australian genus *Pteropus.*

RHINOLOPHIDÆ.—Warmer parts of the eastern hemisphere. Represented in "Lemuria" by species of *Rhinolophus.*

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* Geogr. Distr. Anim., vol. i, p. 273; Nature, vol. xvi (Oct. 25, 1877), p. 548.

† See especially Prof. O. C. Marsh's address on "the Introduction and Succession of Vertebrate Life in America", delivered before the Nashville meeting of the American Association for the Advancement of Science, Aug. 30, 1877.

Vespertilionidæ.—Cosmopolitan. Represented by the cosmopolite genus *Vespertilio*.

Emballonuridæ.—Warmer parts of the world. Represented by the genus *Taphozous*.

Centetidæ.—Confined to Madagascar except one genus (*Solenodon*) in the West Indies. Represented in Madagascar by nearly a dozen species. Genera:—*Centetes*, *Hemicentetes*, *Ericulus*, *Oryzorictes*, *Echinops*.

Soricidæ.—The whole world, except South America and Australia. Represented in Madagascar by one or two species of *Crocidura*, a genus found in Africa, and the warmer parts of the eastern hemisphere generally.

Muridæ.—Cosmopolitan. Represented by several genera of African affinities, namely, *Nesomys*, *Brachytarsomys*, *Hypogeomys*.

VIII.—ANTARCTIC REALM.

The Antarctic Realm is geographically almost wholly oceanic, and its fauna hence consists almost exclusively of marine or pelagic species. It necessarily embraces not only the Antarctic Zone, but a large part of the cold south-temperate, since very few of its characteristic species are wholly restricted to the Antarctic waters. It will hence include not only the few small groups of Antarctic Islands, but also Tierra del Fuego and the Falkland Islands, and perhaps also the extreme southern shores of South America, while some of its characteristic forms also extend to New Zealand, and even Australia and the Cape of Good Hope. The only mammals that can be considered as strictly characteristic of this region are Pinnipeds and Cetaceans, of which several genera of each are almost wholly restricted to it. A "South Frigid", "Antarctic", or "South Circumpolar" "Zone", "Region", or "Realm", has been recognized by various writers for the marine invertebrates, and, by von Pelzeln for birds, with limitations much as here assigned. While the number of species peculiar to it is small, it is large relatively to the whole number represented, especially in the colder latitudes. There is, of course, a broad belt along its northern border of a transitional character, where Antarctic types overlap the range of groups characteristic of south-temperate latitudes.

One of the most important features of the South Circumpolar or Antarctic Realm is the resemblance of its life to the marine life of the Arctic or North Circumpolar Realm. While perhaps in no case are the species identical, the genera are frequently the same, not only among the mammalia, but among invertebrates. This is especially significant as regards the mammalia, since the terrestrial mammals of the extreme north and extreme south present no such parallelism, but the utmost divergence. Among Pinnipeds, most of the genera are peculiar to either the northern or southern waters, but in several instances the genera of the two regions are strictly representative. Thus, *Otaria* and *Arctocephalus* of the Southern Seas are represented in the Northern by *Eumetopias* and *Callorhinus*. *Zalophus* and *Macrorhinus* are both Northern and Southern. *Stenorhynchus*, *Lobodon*, *Leptonyx*, and *Ommatophoca* are strictly Southern, while *Phoca*, *Halichœrus*, *Erignathus*, *Cystophora*, *Monachus*, and one or two others, are strictly Northern, as are also the Walruses. The *Mysticete*, or Baleen Whales, among Cetaceans, have a somewhat similar distribution. While a few genera are restricted respectively to the Northern and Southern waters, the larger number are common to both, though represented by different species in the two regions, while they are (in some cases at least) absent from the intervening tropical seas. A large proportion of the *Denticete*, or Toothed Whales (Dolphins, Porpoises, Rorquals, etc)., are either limited to the warmer seas or have there their chief development, quite a number of genera being peculiar to the tropics. Others, however, like *Monodon*, are eminently boreal, while others, like *Beluga*, are common to the colder waters both north and south of the tropics. In most cases, however, we know as yet too little respecting the range of the different species and genera of *Cetacea* to be able to make much use of them in determining questions in geographical zoölogy.

This similarity between the marine life of the Arctic and Antarctic Regions evidently indicates that the forms common to the two had a common origin, and, at some former period, a continuous, probably circumtropical, distribution, and that on the increase of temperature in the intertropical regions, through well-known geological causes, they sought the more compatible cooler waters toward the poles. The similarity of the Arctic and Antarctic marine life is also a feature that sharply differentiates the fauna of the South Circumpolar Realm from that of the South Temperate and Tropical Zones.

III.—GENERAL SUMMARY.

As stated at the beginning of the present paper, one of the chief topics here proposed for discussion was the influences and laws which govern the distribution of life,—whether it is or is not co-ordinated with climatic zones, and governed in a large degree by climatic conditions, and especially by temperature. In fact, so generally is temperature recognized by the leading writers on the distribution of marine life that it seems superfluous to reiterate or emphasize this principle. That the zones of life should be perhaps a little less obvious over the land-areas,—in consequence of the diversity of contour resulting from differences of elevation, and the interruptions and exceptional conditions due to mountain chains and high plateaus,—than over the oceanic expanses, is naturally to be expected. That there is, however, a similar correspondence between climatic belts and the zones of life seems to me abundantly evident. As has been already shown, the broader or primary zones are, first, an Arctic or North Circumpolar Zone, embracing the arctic, subarctic, and colder temperate latitudes of the northern hemisphere, throughout the whole of which area there is a marked homogeneity of mammalian life, as well as of animal and vegetable life in general; secondly, that below this there is a broad belt of life, which, in its general *facies*, is distinctive of the temperate and warm-temperate latitudes, and that these two zones of life are far more closely related *inter se* than with the life of the intertropical regions, with which regions they may be collectively contrasted, and together receive the appropriate name of "*Arctogæa*";

thirdly, it has been shown, so far as the northern hemisphere is concerned, that the life of the tropical and temperate regions of the same continent is more widely different than is the life of corresponding portions of the temperate and colder parts of the (so-called) Old World and the New; fourthly, that the life of Tropical America has very little in common with that of the tropical portions of Asia and Africa; fifthly, that the life of the South Temperate Zone presents a *facies* distinct from that of the tropics, and has still less in common with that of the North Temperate Zone; sixthly, that Australasia is so highly differentiated as to form a distinct primary region, having little in common with other lands, even with those of contiguous regions, or those having a similar geographical position; seventhly, that Madagascar and its contiguous islands, while to some extent African in affinity, form also a highly specialized region; lastly, that the antarctic and cold south-temperate oceanic regions are recognizable as a primary region, characterized by a peculiar general *facies* of life that more strongly recalls that of the corresponding portions of the northern hemisphere than of any other portion of the earth. It has been further shown that the Australian Realm is divisible into temperate and tropical portions, and also that the land surface is separable into zones of even still narrower limits, corresponding in a general way with those recognized by Dana for marine life.

The almost total absence of identical genera, or even of families, excepting such as are essentially cosmopolitan, in the American and Old World tropics, as well as the distinctness of the Lemurian Realm, and the almost total isolation of the Australian Realm, evidently require for their explanation other causes than merely the existing climates. The geological history of these land-areas and their faunæ must be of course considered in order to understand their present relationships. As the northern hemisphere at present most clearly shows, nearly continuous land surface and similarity of climatic conditions implies identity of fauna, while isolation, especially when joined with diverse climatic conditions, implies diversity of life, and a differentiation proportionate to the degree of isolation, and the length of time such isolation has existed; in other words, that the present want of affinity between the life of the Lemurian and Australian Realms and that of the rest of the world is due rather to their long geographical isolation than to present climatic conditions, and that we here find, for reasons perhaps not wholly apparent, the remnants of a somewhat primitive or early fauna that was formerly shared more largely by other areas than at present,—that these regions became isolated before the development of many of the higher and now prevalent types of the larger and more diversified land-areas, and that here differentiation has proceeded less rapidly and along fewer and narrower lines than elsewhere; furthermore, that the present highly diversified fauna of the chief tropical areas, in comparison with the fauna of the north-circumpolar lands, is due in part to the southward migration, near the close of the Tertiary period, of forms adapted to a high temperature, and in part to the high rate of differentiation favored by tropical conditions of climate. Hence, given: 1. Arctic and cold-temperate conditions of climate, and we have a fauna only slightly or moderately diversified; 2. A moderate increase of temperature, giving warm-temperate conditions of climate, and we have the addition of many new types of life; 3. A high increase of temperature, giving tropical conditions of climate, and we have a rapid multiplication of new forms and a maximum of differentiation. Again, given: 1. A long-continued continuity of land surface, and we have an essential identity of fauna; 2. A divergence and partial isolation of land-areas, and we find a moderate but decided differentiation of faunæ; 3. A total isolation of. land-areas, and we have a thorough and radical differentiation of faunæ, proportioned to the length of time the isolation has continued. Hence, the present diversity of life is correlated with two fundamental conditions: 1. Continuity or isolation, past as well as present, of land surface; and, 2. Climatic conditions, as determined mainly by temperature.*

In accordance with these principles, which rest on incontrovertible facts of distribution, it follows that the nearly united lands of the North present a continuous, almost homogeneous, arctopolitan fauna; that farther southward, in the warmer temperate latitudes, we begin to find a marked differentiation on the two continents; that this differentiation is still further developed in the tropical continuations of these same land-areas, till an almost total want of resemblance is reached, except that there is what may be termed, in contrast with the more northern regions, a "tropical *facies*" common to the two. The small amount of land surface belonging to these primary land regions south of the tropics have no more in common (a few marine species excepted) than have these two tropical areas, but it is hardly possible for them to have much less. The Antarctic (mainly oceanic) region has a fauna strongly recalling the marine fauna of the Arctic, but has no resemblance to that of the intervening area.

The northern circumpolar lands may be looked upon as the base or centre from which have spread all the more recently developed forms of mammalian life, as it is still the bond that unites the whole. Of the few cosmopolitan types that in a manner bind together and connect the whole mammalian fauna of the globe (the Lemurian and Australian Realms in part excepted), nearly all have either their true home or belong to groups that are mainly developed in the northern lands. A few have been pressed a little to the southward by the extreme rigor of an Arctic climate, but are still characteristic elements of all boreal faunas. The very few truly tropicopolitan mammalia are either *Chiroptera*, or marine, or at least aquatic, and have thus exceptional means of dispersal.

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* In illustration of the above, it may be added that the circumpolar lands north of the mean annual of 36° F., or, in general terms, north of the fiftieth parallel, with approximately an area of about 12,500,000 square miles, have representatives of about fifty-four genera of mammals; Tropical America, with an approximate area of about 5,000,000 square miles, has about ninety genera; the Indo-African Realm, with an approximate area of about 15,000,000 square miles, has about two hundred and fifty genera. Hence the tropical lands are four to five times richer in genera, in proportion to area, than those of the Cold-temperate and Arctic regions.

The primary regions and their subdivisions, recognized in the preceding pages, are enumerated in the subjoined schedule.

1.—*Primary divisions, or "Realms"*.

I. An ARCTIC, or NORTH CIRCUMPOLAR.
II. A NORTH TEMPERATE, divided into two regions and eight provinces.
III. An AMERICAN TROPICAL, with three regions. (Provinces not characterized.)
IV. An INDO-AFRICAN, with two regions and five provinces.
V. A SOUTH AMERICAN TEMPERATE, with two provinces.
VI. An AUSTRALIAN, with three regions and two provinces.
VII. A LEMURIAN.
VIII. An ANTARCTIC or SOUTH CIRCUMPOLAR.

2.—*Secondary divisions, or "Regions"*.

II. North Temperate Realm: 1, American; 2, Europæo-Asiatic.
III. American Tropical Realm: 1, Antillean; 2, Central American; 3, Brazilian.
IV. Indo-African Realm: 1, African; 2, Indian.
VI. Australian Realm: 1, Australian (Australia, Tasmania, and New Guinea); 2, Polynesian; 3, New Zealand.

3.—*Divisions of third rank, or "Provinces"*.

II, 1. American Region: *a*, Boreal*; *b*, Eastern; *c*, Middle; *d*, Western.
II, 2. Europæo-Asiatic Region: *a*, European; *b*, Siberian; *c*, Mediterranean; *d*, Manchurian.
IV, 1. African Region: *a*, Eastern; *b*, Western; *c*, Southern.
IV, 2. Indian Region: *a*, Continental; *b*, Insular.
V. South American Temperate Realm: *a*, Andean; *b*, Pampean.
VI, 1. Australian Region: *a*, Australian; *b*, Papuan.

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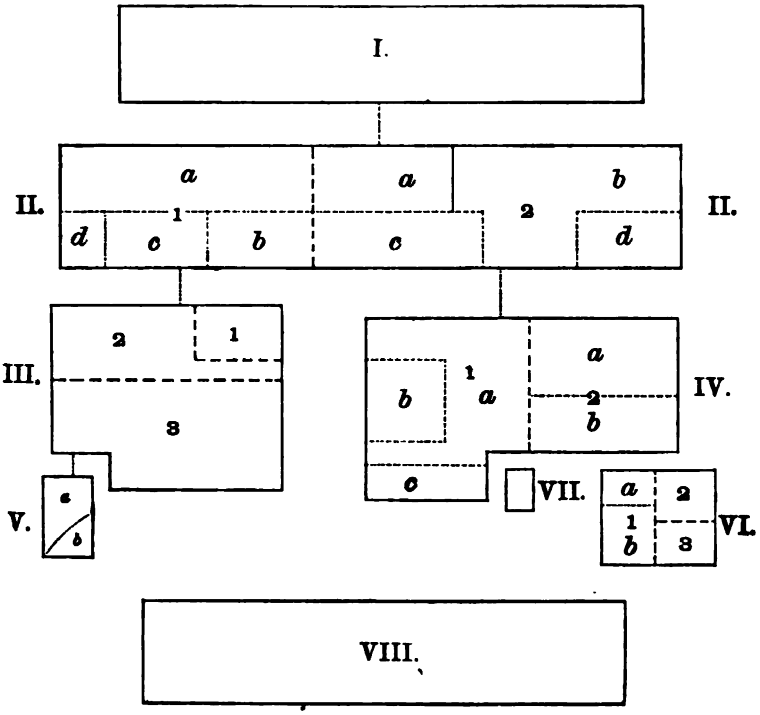
*A "Boreal" province has not been distinctly recognized in the preceding pages as a division belonging to the same category as the other so-called or commonly recognized provinces, and is not at all recognized in the table of distribution given at p. 339. It is nearly equivalent to what is there implied by "Cold Temperate". I hope soon to be able, in a paper to be devoted especially to a consideration of the geographical distribution of North American mammals, to define and characterize it more definitely.

The relation of the different primary regions and their subdivions may be approximately indicated diagrammatically as follows:—



ART. XVI.—DESCRIPTIONS OF NEW EXTINCT VERTEBRATA FROM THE UPPER TERTIARY AND DAKOTA FORMATIONS.

BY E. D. COPE.

CARIACUS DOLICHOPSIS, *sp. nov.*

John Collett, of the Geological Survey of Indiana, discovered in a late lacustrine deposit in Vandenburg County, Indiana, a number of Postpliocene fossils. One of these is the ulno-radius, etc., of a *Bos*, and another is the left mandibular ramus of a deer, probably of the genus *Cariacus*. The jaw differs in its proportions from those of *C. virginianus*, *C. macrotis*, and *C. columbianus*, with a considerable number of which I have compared it. It belonged to an animal of the average size of the *C. virginianus*, but differs in having the diastema an inch or more longer, while the tooth-line is shorter. Placing the first molars in line, the last molar of the fossil form attains only the penultimate column of that of the *C. virginianus;* in some cases just a little farther. On the other hand, the angle of the mandible extends beyond that of the *C. virginianus*, and the slope of the anterior base of the coronoid process is more gradual. At the same time, this portion is less oblique in the transverse direction, owing to the prominence of the external face of the ramus. This ramus differs also in the great prominence and anterior position of the posterior edge of the masseteric fossa, which leaves behind it a wide oblique face little developed in the existing species. The species being clearly new, I call it *Cariacus dolichopsis*.

Measurements.

	M.
Horizontal length of ramus from alveolar border	0.250
Length to first molar	0.100
Length of symphysis	0.047
Length of dental series	0.085
Length of premolars	0.034
Length of base of ascending ramus	0.058
Elevation of condyle	0.075
Length of base of coronoid process	0.021
Width of coronoid	0.021
Width of last molar	0.011
Length of last molar	0.021
Length of third premolar	0.011
Depth of ramus just behind symphysis	0.016
Depth of ramus at first molar	0.026
Depth of ramus at last molar	0.028

The intercolumnar tubercles are small, and are only present in the true molar teeth. The molars are about half-worn; at this stage, the anterior lake of the three last, communicate with the median inner vertical fissure, by their posterior horn.

AUCHENIA VITAKERIANA, *sp. nov.*

This llama is represented by a portion of the left maxillary bone supporting molar teeth, which was found in a Pliocene deposit in Oregon, in association with two larger species of the genus, the *A. hesterna* and the *A. major* (*Palauchenia* Owen). Its size is less than those attained by the two species named, but exceeds considerably that of *A. lama* of the Andes. The details of the structure of the first and second true molars are quite similar to those of the existing species. The last premolar is broken away, but its roots show that its size was considerable, lacking little in antero-posterior diameter that of the first molar. The base of the first (or third) premolar is very small. It possessed either but one small root, or possibly two, the second being represented by a small fossa on the inner side of the anterior root of the last premolar, of doubtful significance. The palatal foramen is opposite the line of contact of the two premolars, instead of anterior to the first, as in *A. lama.* The infraorbital foramen is over the line of contact of the last premolar and first true molars.

Measurements.

	M.
Length of bases of molar series, the last one omitted	0.069
Length of crown of first true molar	0.024
Width of crown of first true molar	0.014
Length of base of last premolar	0.020
Width of palate at first true molar	0.042

This species is dedicated to Governor John Whitaker, of Oregon, who discovered the locality from which this fossil was obtained. The formation is Pliocene.

TICHOLEPTUS ZYGOMATICUS, *gen. et sp. nov.*

Char. gen.—This genus is known from cranial characters only. Dental formula, I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pm. $\frac{4}{4}$; M. $\frac{3}{3}$. Teeth in general similar to those of *Oreodon;* the true molars with short crowns; the first inferior premolar the functional canine. Premaxillary bones consolidated into a single mass; symphysis not co-ossified. A preorbital fossa, and a large foramen in front of it, bounding the maxillary bone superiorly and posteriorly. No vacuities between the orbits.

This genus of *Oreodontidæ* occupies an interesting position between the three prominent forms of the family, *Oreodon*, *Merycochœrus*, and *Leptauchenia.* It combines the dentition and preorbital fossa of the first with the solid premaxillary of the second and the large facial vacuities of the third.

Char. specif.—The *T. zygomaticus* is only known from the cranium of an animal of the size of the *Oreodon major*. It has been somewhat flattened by lateral pressure, but is seriously injured in the nasal region only.

The front is convex and descending toward the muzzle, and the sagittal crest is strong. The orbits were probably closed behind, but the postorbital border was narrow, and is not completed next the frontal in the specimen, which is probably due to pressure. The lateral spines of the premaxillary bones rise obliquely backward, shortening the face so as to indicate that the nasal bones are short. The naso-maxillary suture is short, and is terminated behind by a very large facial foramen, which has a greater vertical than longitudinal extent. It bounds the anterior margin of the thin lachrymal bone at the fundus of the preorbital fossa. The facial plate of the maxillary is plane. The zygomatic arc hsprings abruptly outward above the fourth premolar, and has a wide lateral curvature round the zygomatic fossa. Its horizontal width equals its depth at the last molar tooth. The squamosal portion of the zygomatic arch is expanded horizontally, and not vertically, having a nearly straight lateral border to behind the line of the postglenoid process, where it terminates in an obliquely truncate extremity. This truncation forms with the mastoid region a deep notch. The postglenoid process is small, and is confined to the inner half of the zygomatic portion of the squamosal bone. The orbit is rather small. The infraorbital foramen is small, and probably issues above the fourth premolar, but its position is somewhat obscured in the specimen by fissures. The nasal fissure of the premaxillary extends downward nearly to the line of the alveolar border of the maxillary. The alveolar border of the premaxillary extends below this line, and is convex downward.

The mandibular ramus projects a little behind the condyle, and descends in a vertical straight line, and is then regularly convex. The symphysis is quite oblique.

The second and third premolars of the superior series are longer than the fourth, and their external apices are in advance of the middle. The superior true molars are remarkable for the great prominence of the vertical ribs which mark the anterior horns of the external crescents. The posterior one, at the middle of the tooth, is the most prominent, and encloses with the external face of the crown a deep fossa. There is a third or posterior column on the last superior molar, which forms a small heel on section. The external ribs of the inferior true molars are very prominent, and the last possesses a prominent fifth lobe, or heel. The incisors are rather small, the external as usual the largest. The canines are but little enlarged.

Measurements.

	M.
Length from premaxillary to occipital condyles	0.225
Length from premaxillary to postglenoid process	0.175
Length from premaxillary to end of last upper molar	0.116
Length from premaxillary to opposite anterior border of orbit	0.084
Width of zygoma external to postglenoid process	0.027

Width of zygoma above last superior molar	0.023
Depth of maxillary bone at second premolar	0.053
Depth of common premaxillary at middle	0.014
Depth of ramus mandibuli at condyle	0.084
Depth of ramus mandibuli at last molar	0.044
Depth of ramus mandibuli at second premolar	0.032
Length of superior molar series	0.095
Length of superior premolars	0.044
Length of superior last molar	0.021

There is some resemblance between this species and some of the *Merycochœri*, including under this head the *Merychyi* according to Leidy's latest view. It may be readily distinguished from the *M. elegans* and *M. rusticus* by the deep nareal fissure of the premaxillary, and the salient ridges of the molar teeth, together with very prominent malar bone and zygomatic arch. The same characters distinguish it also from the *M. proprius* and *M. major*, which are besides much larger species.

From the Upper Miocene of Montana; found by my assistant, J. C. Isaac.

A brief notice of this species appeared in the American Naturalist for February, 1878.

BLASTOMERYX BOREALIS, Cope, Palæntological Bulletin, 28, p. 222.

Additional specimens of this species enable me to add some points of importance to the generic and specific characters which I have already given.

The posterior lake of the superior premolars is represented by a loop or circle of enamel. The borders of the lakes of the true molars are plicated, as in some of the species of horses. There is a strong sagittal crest and a high inion. The bases of the horns are expanded outward in a vertical laminar border.

APHELOPS FOSSIGER, *sp. nov.*

This rhinoceros is known from a considerable number of specimens. Among these are three more or less complete crania, in some of which a large part of the dentition remains. These are all from the Loup Fork beds of Kansas. They afford an excellent basis of comparison with the *Aphelops* already described from Nebraska, Colorado, and New Mexico.

This species reached larger dimensions than any of those already described from this continent, excepting only the *Aphelops jemezanus* Cope, from New Mexico. I compare it with the *A. megalodus*, of which I procured a perfect and some imperfect skulls in Colorado in 1873.

The occipital outline is expanded latterly, and is nearly horizontal above. It is vertical in profile, and the fossa for the *ligamentum nuchæ* is divided by a vertical massive keel. The condyles are rounded, and not flattened at their extremities. The paramastoid and postglenoid processes are of nearly equal lengths, and the *meatus auditorius* is closed below by contact of the mastoid and squamosal bones, which do not co-ossify. The temporal fossæ are only separated above by a narrow, low, median ridge, which is obsolete in some specimens. The top of the skull is horizontal in profile, as is the zygoma. The preorbital region is convex, and the supraorbital border is horizontal and convex. Infraorbital foramen above the third premolar, and the other above and behind the former. In the best preserved cranium, the molars of the right side are preserved. These are markable for the great depth of their sinuses, the posterior notch being closed very early, and forming a deep, isolated pit. The transverse valley is almost closed by the protuberances of its walls, and is strongly curved backward at its extremity. In the same specimen, the inner extremity of the anterior crest of the true molars is pinched into a peninsula by two opposite vertical grooves. No cingulum on the inner base of the true molars. The teeth are of relatively large size.

In a fourth specimen, the posterior part of the mandibular ramus is preserved. This has the flat, anterior base of the coronoid process, and compressed ramus of the *A. megalodus*, as distinguished from *A. crassus* and *A. jemezanus*, but the form is quite different from that in the first-named species. The last molar is considerably in advance of the base of the coronoid, and the latter, instead of rising vertically, slopes away posteriorly toward the condyle. The latter is unusually robust. The masseteric fossa is deeper than in the *A. megalodus*, as is also the pterygoid fossa.

Measurements.

	M.
Length of skull along base to front of third premolar	0.550
Width of occiput above middle	0.200
Elevation of occiput	0.230
Depth of zygoma at orbit	0.075
Length of Pm. 2–3 + M. 1–2–3	0.280
Length of true molar series	0.190
Length of second true molar	0.072
Width of second true molar	0.080
Width of third true molar	0.075
Length of third true molar	0.062
Width of palate between bases of third true molars	0.070

In *A. megalodus*, the occiput is narrowed upward instead of widened, the tooth-crowns are short, and the nasal bones are long, extending anterior to the entire dental series. It is a smaller species; the type-specimens are adult, while in the skull of *A. fossiger*, above described, the last molar is not fully protruded.

APHELOPS MALACORHINUS, *sp. nov.*

This large species presents many differences from the *A. fossiger* and *A. megalodus*. The parietal region rises obliquely from the front to an elevated occiput. The zygoma slopes obliquely upward and backward. The interorbital region is wide, but the superciliary borders are not convex and horizontal, but contract directly into the temporal fossa. The nasal bones are very short and small, ceasing above the third superior molar. The anteorbital region is concave, and there are three infraorbital foramina, one within the nasal cavity. The superior edge of the maxillary is broadly incurved. There are two lachrymal foramina, both within the orbit. The palatine and pterygoid regions are wider than in *A. fossiger*, and the pterygoid processes of the alisphenoid originate farther back. The crowns of the molars are short, with posterior notch not inclosed, and resemble those of *A. megalodus*.

Measurements.

		M.
Length of skull to first premolar along base		0.550
Length of true molar series		0.160
Diameter of second true molar	antero-posterior	0.062
	transverse	0.062
Width of palate between bases of third true molars		0.110
Interorbital width		0.230
Length of freepart of nasal bones		0.140
Elevation of occiput from base		0.220

This rhinoceros is quite unlike anything yet discovered. I possess a fine cranium, which was found in the Loup Fork beds of Kansas by my assistant, R. S. Hill.

MYLAGAULUS SESQUIPEDALIS, *gen. et sp. nov.*

Char. gen.—Order *Rodentia*. Represented by a molar tooth, which is the first or last of the series. It is rootless, and is oval in section, the long diameter being probably transverse to the long axis of the cranium, and shortening toward the apex of the crown. Shaft curved in the direction of its short diameter. The tooth is inclosed in an uninterrupted sheath of enamel, without inflections. Within this are several enamel tubes, which form oval and crescentic figures in section on attrition. The long diameters of these are parallel with those of the crown.

The peculiar molar tooth which indicates the genus above described is not comparable to that of any recent or extinct type now known from this continent. The entire inclosure of the subordinate enamel areas within the investing cylinder resembles most the arrangement seen in the inferior molars of some species of *Dasyprocta* when much worn, and it is quite probable that the genus *Mylagaulus* belongs to the same family. It differs from the genera which are known in the transverse relation of the long diameter of this tooth to that of the skull, as well as in the resulting narrow forms of the inclosed enamel areas. It is possible that in an earlier stage of wear some of these areas may have opened on the internal or external faces of the tooth, but this is, of course, uncertain, and is less probable than if the fore-and-aft diameter of the crown were greater.

Char. specif.—Grinding surface a regular oval. Enamel areas two longer and four shorter. Of the former, one is an open crescent, extending from near one extremity of the grinding face to near its middle; the other originates near the corresponding position at the opposite end of the surface, and then curves on itself, forming more than a semicircle. Between these and the more convex side of the tooth are three elongate-oval enamel areas, the two longest of which overlap each other. On the opposite side of the principal areas there is but one lesser area, which is adjacent to the median extremity of the less curved of the principal areas, and parallel with its inner half. The shaft is a good deal more compressed at the base, and the long diameter is somewhat greater than above. One side of the shaft is convex in both directions; the opposite side is concave in the long direction, and slightly convex transversely. The enamel is obsoletely rugose.

Measurements.

		M.
Length of crown as worn		0.0130
Diameter of grinding-face	long	0.0075
	short	0.0050

The size of this species was at least that of the American porcupine. The remains on which it is founded were found by R. S. Hill in the Loup Fork beds of Kansas.

MYLODON SODALIS, *sp. nov.*

The occurrence of this genus of sloths in Oregon was pointed out some years ago by Professor Leidy, as indicated by a specimen preserved in the museum of the Smithsonian Institution, but the means of determining its specific relations to the other species of the genus were not at that time extant. A number of phalanges, including those of the ungues, contained in my collection, demonstrate that the species of Oregon was quite different from those of the eastern portion of North America.

The ungual phalange selected for description has its basal sheath developed on one side only; its place is taken on the opposite side by a prominent rim, which is tuberculate and notched. The rim is low on the superior part of the proximal extremity, and is separated from the articular cotylus by a concave subvertical surface, wider than long. The basal tendinous insertion is subdiscoid and flat, with a lateral projecting rim, which is pierced at the base by the arterial foramina. The general form of the phalange is more compressed than in *Mylodon harlani.* Its superior middle line is broadly rounded, and continues nearly uniform to the apex. One side is subregularly convex; the other is divided into three planes. The middle one of these is flat, and terminates in a short lateral ridge which extends to the apex. The superior plane becomes somewhat concave near the apex, and the inferior gently convex.

The proximal phalanges have the form usual in the genus. They are rather short, and with the trochlear tongues and grooves strongly marked. The proximal extremities are especially expanded in the vertical direction.

Measurements.

	M.
Length of ungual phalange	0.135
Vertical proximal depth	0.058
Vertical depth at middle of inferior tendinous tuberosity	0.055
Vertical depth just beyond inferior tuberosity	0.044
Width of proximal cotylus	0.052
Width of unguis at middle	0.033
Width of unguis near end	0.020
Length of penultimate phalange	0.065
Depth of penultimate across condyles	0.040
Width of penultimate across condyles	0.033
Depth of proximal end	0.052

In size, this species equalled the *M. harlani* or the *Megalonyx jeffersonii*.

From the Pliocene of Oregon.

GRACULUS MACROPUS, *sp. nov.*

This cormorant is represented by numerous bones in my collection, of which I select three nearly perfect tarso-metatarsi as representative. One of these is 4^{mm} longer than the others, and is one-fourth of its length longer than the corresponding bone in the *G. dilophus*. The shaft is grooved in front deeply for the proximal third, shallowing to and on the remaining portion, with the external margin the more elevated, but descending distally. On the posterior face of the shaft there is a median longitudinal angle along the distal half of the length, which curves outward to the inner base of the external trochlea. The hypotarsal crest disappears on the inner side of the middle crest, near its proximal extremity. A delicate crest originates at the inner side of the proximal end, and curving backward returns to the inner side at the anterior base of the external trochlea. There is a rough ridge on the inner side of the posterior face of the shaft on its distal third. The borders of the trochlea are prominent, particularly the posterior extremities of those of the median trochlea. There is a median longitudinal angle on the proximal third of the inner side, and a weaker one on the postero-internal side for the proximal fourth. The four insertions of the flexor tendons of the tarso-metatarsus are distinct. The hypotarsus is not so long as in *G. dilophus* and *G. penicillatus*, and terminates obtusely. Its length is equal to the antero-posterior diameter of the internal cotylus, whereas it is greater in the two species named. The tendinous canal on their inner side is open and not closed, as in the two species named, and it is as large as the groove at the base of the hypotarsus. The external cotylus is a little smaller than the internal, and has a truncate external border; the external posterior notch is small.

Measurements

	M.
Length, No. 1	0.082
Width, proximally	0.017
Width at middle of shaft	0.0095

Antero-posterior diameter proximally	0.021
Antero-posterior diameter at middle	0.008
Antero-posterior diameter of median trochlea	0.010
Antero-posterior diameter of internal cotylus	0.011
Length, No. 2	0.081
Transverse diameter of all the trochleæ at their middles	0.017
Length, No. 3	0.085
Transverse diameter of trochleæ	0.019

This species appears to have been common in the Pliocene of Oregon, where it was discovered by Charles H. Sternberg. In measurements it considerably exceeds the *G. dilophus*, which is, according to Professor Baird's diagnosis,* the largest of the North American species. With this bird, the extinct *G. idahensis* Marsh nearly agrees in measurements, exceeding a little the corresponding parts of the living bird. These I have had the opportunity of studying through the great courtesy of the Direction of the Smithsonian Institution. The specimen examined is No. 11120 of the Smithsonian Catalogue.

ANSER HYPSIBATUS, *sp. nov.*

A single tarso-metatarsus, perfect except in the hypotarsus, represents this goose. It is nearest to the *A. canadensis* among American geese, and I compare the specimen with the corresponding bones of three individuals of that species, two of them cotemporary fossils, and one a recent bird, No. 11086 of the Smithsonian Catalogue. For the use of the latter I am indebted to Professor Henry.

The element mentioned is longer and more slender than that of the *A. canadensis*, and differs in a variety of points from that bird. The proximal two-fifths of the shaft is more deeply grooved, and the lateral ridges are more prominent. This is especially true of the external angle, which continues straight to the anterior border of the diaphysis, where it is wanting or weak in the *A. canadensis*. The external side is also plane, or nearly so, to this angle, while in the existing bird it is swollen, having a narrow convex surface, which passes insensibly into the anterior and posterior faces. This character continues to distinguish the external faces of the shaft of the bone to near the distal extremity in the two species. The angular posterior edge of the inner face is more prominent than the corresponding and fainter posterior border of the inner face. From this it follows that the posterior face of the shaft at its middle is oblique, sloping forward and inward. In *A. canadensis* it is plane or gently convex. The superior part of the posterior face is oblique in the opposite direction, and is much narrower than the corresponding face in *A. canadensis*.

Measurements.		M.
Length of bone		0.087
Transverse diameter	proximally	0.016
	medially	0.006
	distally	0.018
Width of internal cotylus		0.007

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* U. S. Pac. R. R. Surveys, ix, p. 877.

This goose had longer legs and probably larger dimensions than any of the existing North American species. It was discovered in the same locality as the last species by Professor Thomas Condon, of Eugene City, Oreg.

CYGNUS PALOREGONUS, *sp. nov.*

Represented by numerous bones, especially by four tarsometatarsi, two of which are nearly perfect. These indicate a species of the size of those now existing on this continent, but different from them. The characters of the three species are contrasted in the following table:—

	C. buccinator.	*C. paloregonus.*	*C. americanus.*
Shaft	More slender	More robust	More robust.
Posteriorly	Slightly convex; no ridges	Convex; two rough lateral and a narrow median ridge.	Concave; two lateral ridges.
Inner side	Flat proximally	Convex proximally	Convex proximally.
Outer side	Proximal concavity deep	Proximal concavity deep	Proximal concavity deep.
Hypotarsal crests	Third crest not descending below foramen; longer than second; fourth not reaching foramen.	Third crest reaching below foramen, longer than second; fourth sending keel over foramen.	Third crest not reaching below foramen, equal second; fourth reaching foramen.
Cotyli	Outer larger than inner, well separated from inner by a narrow deep space; posterior facet not distinct.	Outer not larger than inner, separated by a wide open space; posterior facet not distinct.	Outer considerably larger than inner, transverse, separated by a shallow, little marked space; posterior facet quite distinct.
Distal tendinous foramen.	Small	Large	Least.
External side distally.	Smooth	Ridged	Smooth

The lateral ridges which bound the posterior face in this species, which are wanting in *C. buccinator* but present in *C. americanus*, are strongly convex backward, so as to narrow their interspace in a manner not seen in either of the recent species. Their divergence at the extremities causes, in the proximal end of the bone, that the posterior face is considerably wider than in the *C. buccinator*.

Measurements.

		M.
Length of tarsometatarsus		0.115
Transverse diameter	proximally	0.025
	medially	0.011
	distally	0.024
Antero-posterior diameter	medially	0.010
	of middle trochlea	0.016

For the opportunity of studying the osteology of the existing birds of North America, I am indebted to the Smithsonian Institution. The specimens of the *Cygnus buccinator* and *C. americanus* which I have examined are the Nos. 8033 and 11093 of the Smithsonian Catalogue, respectively.

This swan was discovered by Ex-Governor Whitaker, of Oregon, in the Pliocene formation of that State. The same bird was afterward procured by my assistant, Mr. C. H. Sternberg, who obtained at one locality the bones of the following birds:—

Podiceps occidentalis.
Podiceps near *californicus.*
Podilymbus podiceps.
Graculus macropus, sp. nov.
Anser hypsibatus, sp. nov.
Anser canadensis.
Anser albifrons gambeli.
Anser near *nigricans.*
Cygnus paloregonus, sp. nov.
Fulica americana.

These were associated with the following *Mammalia*:—

Auchenia vitakeriana, sp. nov.
Auchenia magna (*Palauchenia* Ord).
Auchenia hesterna.
Equus major.
Equus occidentalis.
Elephas primigenius.
Canis latrans.
Lutra near *piscinaria.*
Castor fiber.
Thomomys talpoides.
Thomomys near *clusius.*
Mylodon sodalis, sp. nov.

HYPSIROPHUS DISCURUS, *gen. et sp. nov.*

A form of this order has recently been discovered in the Dakota beds of Colorado by Mr. Lucas, which is quite different from those already announced. The vertebræ resemble those of typical *Dinosauria* in their solidity and slightly amphicœlous extremities and in the wide discoidal form of the proximal caudals, but differ from them in the extraordinary elevation of the dorsal zygapophyses, which stand on a stem composed of the neurapophyses. The anterior zygapophyses of the dorsal vertebræ are united on the middle line, forming a basin, which receives the posterior zygapophyses. This is not the case in the anterior caudals, where the zygapophyses have their usual position, and the summit of the neural spine is expanded transversely. This genus has been named by me (American Naturalist for March, 1878) *Hypsirophus*, and the species *H. discurus.* The dorsal vertebra of the latter measures $0^m.105$ to the base of the neural arch, and $0^m.300$ to the middle of the faces of the posterior zygapophyses. The centrum is $0^m.105$ wide. The caudal centrum is $0^m.175$ wide and $0^m.160$ high. The neural arch and spine are $0^m.575$ high, and the latter $0^m.040$ wide at the base and $0^m.130$ wide at the summit. The species was as large as *Hadrosaurus foulkii.* It is not impossible that it may be the same as the *Lælaps trihedrodon* Cope (Bull. U. S. Geol. Surv. Terrs., 1877, iii, 806).

This species was referred by me to the genus *Lælaps* provisionally, as no characters could be discovered in the mandibular ramus and teeth, the only portions in my possession which indicated a genus distinct from those already known. I have since received from Mr. Lucas a femur and other bones from the locality from which the jaw and teeth were derived, which is appropriately proportioned to them, and in other respects similar to the corresponding parts of other carnivorous *Dinosauria*. A comparison with the femora of *Lælaps* and *Megalosaurus* shows that the carnivore of the Dakota Reptilian fauna can be referred to neither of these genera. Its characters are as follows:—

Head flattened and transverse. Great trochanter not produced to the head, prominent, and terminating in a free apex. A considerable third trochanter on the posterior inner side of the shaft. Condyles very convex, moderately produced, separated by a well-marked trochlear, and deep popliteal grooves; surface not pitted. An epicondylar projection on the interior side of the internal condyle.

In the compressed and transverse head this genus agrees with *Lælaps*, but the internal epicondylar tuberosity is not found in that genus. The distal extremity of the femur rather resembles that of *Megalosaurus*, which, according to Owen, presents the tuberosity in question. This genus has, however, according to the same author, a round head, so as to be quite distinct from that of this form. From the other *Dinosauria* of the Dakota, whose femora are known, which belong to the genera *Camarasaurus* and *Amphicœlias*, the internal epicondylar enlargement, or rather the contraction of the internal condyle, readily separates it, as well as the larger third trochanter and flat head.

In specific characters, this femur is intermediate between the *Megalosaurus bucklandii* and the *Lælaps aquilunguis*. The shaft is straight, moderately robust, and with a transversely oval section.

BRACHYROPHUS ALTARKANSANUS, *gen. et sp. nov.*

Char. gen.—These are exhibited in vertebræ of the amphicœlous type, with the articular concavities rather shallow, and the centra not shortened. What is probably a dorsal vertebra is shorter than those of more posterior position. None of them display hypapophyses, or any other apophyses or costal articular surfaces. A remarkable character of the genus is the shortness of the pit-like facet for the attachment of the neurapophysis. It is relatively longer on the anterior vertebra, while on the posterior vertebræ it occupies little more than one-third the length of the centrum, those of the opposite sides approaching closely the middle line. Tissue of the centra rather coarsely spongy.

This genus presents characters different from those of any Dinosaurian or Crocodilian with which I am acquainted. The neural arches being lost, some important indications are wanting.

Char. specif.—The concavities of the articular faces of the vertebræ are somewhat unsymmetrical, having one or more fossæ at or near their fundus. The faces, both lateral and inferior, are concave in all the centra, and do not display any sculpture of the surface. The fossæ of articulation of the neurapophyses of the dorsal vertebra are short and wide, and have a deep transverse groove near the middle. Those of the posterior vertebræ are pyriform, with the apices diverging, and approaching nearer the articular extremity than the wide portion of the fossa does the opposite end. The wider portions are most deeply excavated, and approach near together. The borders of the articular faces are more or less bevelled or recurved. The sides of all the centra, including the dorsal, present an obtuse longitudinal angle above the middle, giving a hexagonal section.

Measurements.

		M.
Diameter of dorsal vertebra	antero-posterior	0.045
	transverse	0.046
	vertical	0.046
Length of fossa for neurapophysis		0.019
Diameter of lumbar	antero-posterior	0.050
	transverse	0.039
	vertical	0.040
Length of fossa for neurapophysis		0.018
Diameter of lumbar	antero-posterior	0.050
	transverse	0.036
	vertical	0.038
Length of fossa for neurapophysis		0.020

The vertebræ indicate for this reptile a size similar to that of a fully grown alligator. Discovered by O. W. Lucas near Cañon City, Colo.

AMPHICOTYLUS LUCASII, *gen. et sp. nov.*

Char. gen.—The portions certainly representing this genus consist of dorsal and lumbar vertebræ, ribs, and dermal bones. These indicate that the form is to be referred to the amphicœlous division of the *Crocodilia.* The extremities of the centrum are regularly cupped, the concavity being separated from the edge of the articular face by a plane border. The neural arch is co-ossified with the centrum, which does not display any lateral fossa. It is, however, considerably compressed. The diapophysis of the dorsal is below the neural arch, and near the anterior extremity of the centrum. On the lumbars it rises from the arch, and is long and flat. The anterior zygapophysis projects but little from its anterior border, while the posterior forms a considerable process. There is no hypapophysis on any of the lumbars, and probably none on the last dorsal vertebra. The tissue of the neural canal presents a shallow excavation at the middle of the centrum, uniform and rather finely spongy.

The technical characters of this genus are somewhat like those of *Symphyrophus,*[*] but the two forms are very distinct. The vertebræ of the latter are amphiplatyan, not amphicœlous, and there is a lateral fossa.

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[*] Palæontological Bulletin, No. 28, 246.

Char. specif.—The base of the neural arch extends over the greater part of the length of the centrum. The diapophysis of the dorsal vertebra is compressed so as to be vertical. The centrum is so compressed as to have a narrow inferior surface, forming the apex of a triangle, which the section near the middle will represent. The anterior articular face is subround, the posterior subquadrate. There are some rugosities of the sides of the centra, resulting from small longitudinal grooves of the surface near the extremities.

The anterior zygapophyses of the lumbar vertebræ are transverse ovals. The diapophyses are obliquely truncate at the anterior side of the extremity. The anterior extremity of the centrum becomes more concave on the posterior lumbars, which are also longer than the anterior ones.

Measurements.

		M.
Length of six consecutive dorsal and lumbar vertebræ		0.160
Length of a posterior dorsal		0.023
Diameter of a posterior dorsal	vertical	0.017
	transverse	0.019
Transverse diameter of the same with the diapophyses		0.040

This species, which is smaller than the alligator of the Southern States, is dedicated to Superintendent Lucas, who discovered it near Cañon City, Colo. The bones were found in the light-colored sandstone of the locality which produced the *Camarasaurus supremus*.

TICHOSTEUS ÆQUIFACIES, *sp. nov.*

This species is indicated by a number of vertebræ, from which I select as the best preserved a probably posterior dorsal or lumbar. In accordance with the generic characters, the centrum contains a large median cavity, and the neural arch is freely articulated. The extremities are shallow amphicœlous, and there is no lateral fossa.

The centrum selected has no processes. The diapophyses were probably attached to the neural arch, which is lost. The articular extremities have each a shallow central fossa, and they are nearly similar in the degree of their concavity, which is not the case in the *T. lucasanus*, where one extremity is more concave than the other. They are also more transverse in form than those of the latter species. The centrum is concave inferiorly, but not compressed laterally. The borders next the articular extremities are crimped into short grooves; otherwise the surface is smooth. The floor of the neural canal has a deep longitudinal fossa. The surface for the neurapophysis is nearly as long as the centrum, and is deeply grooved.

Measurements.

		M.
Length of centrum		0.010
Diameter of articular face	vertical	0.007
	transverse	0.010

Found by Mr. Lucas. A fragment of gypsum adhered to the specimen.

XEROBATES ORTHOPYGIUS, *sp. nov.*

This large land-tortoise is represented by numerous remains in my possession. One of these includes the greater part of the entire animal, exhibiting, besides the shell, the limbs and a perfect skull, with mandible. The specimens were obtained by an expedition which explored the fossiliferous Loup Fork beds of Kansas, in charge of R. S. Hill.

The genus *Testudo*, as left by Gray in the "Catalogue of Shield Reptiles", embraces two genera. To one of these Agassiz gave in 1857 the name of *Xerobates*, with a diagnosis. In 1869, Gray characterized the two forms quite exactly (see his "Supplement to the Catalogue", etc.), but retained the name *Testudo* for Agassiz's *Xerobates*, and gave Agassiz's *Testudo* another name (*Peltastes*). As *Xerobates* was first proposed, it is here retained.

This species has numerous peculiarities. The most striking is the form of the posterior free border of the carapace. Instead of being rounded, it is transverse, presenting a rounded lateral angle on each side. The marginal bones of this transverse portion are vertical, extending below the line of the lateral free marginals, and their edges are very little recurved, although acute. The free marginals in front of the latero-posterior angles are not recurved, but are obtuse and somewhat *incurved*, presenting an abrupt contrast to the median marginals; the whole arrangement of the free border thus differing from anything which I have heretofore observed in this genus. The sides of the carapace swell outward, and the scutal sutures are well marked.

The plastron is a little concave, and has thickened borders. These have the peculiarity of rising with a vertical external face to meet the inner inguinal and axillary buttresses of the carapace. There is no transverse buttress or septum in this part of the plastron, and but a slight one on the carapace. The postabdominal bones are not prominent, but are simply emarginate. On the other hand, the clavicular (episternal) bones are produced into a flat beak, which is not emarginate, but truncate in front. It is thickenod backward, and encloses a deep fossa with the succeeding portion of the plastron. The pectoral scuta are exceedingly narrow, and the humero-pectoral dermal suture turns forward to the axilla. The general surface is without sculpture.

There are numerous osseous bosses on the limbs, doubtless ossifications of large marginal and other dermal scuta. They have usually a low apex, central or eccentric.

The maxillary alveolar border is rather finely serrate, and the two inner alveolar ridges are rugose. The premaxillaries are not prominent, and are separated by a slight notch. The cranium is of medium proportions, and neither elongate nor widened. The profile is plane, except a slight descent to the nares. The zygomata were probably complete, but slender. They are broken off in the specimen, but preserved loose. There is a fossa at the base of each exoccipital, and a wide one on the basioccipital. The palatal concavity is deep, and the edges of the pterygoids are narrow. The supraoccipital process is long. Front nearly plane transversely. The mandibular ramus is of uniform depth from the coronoid forward, and the symphysis is subvertical. The inner alveolar edge extends almost to the symphysis.

Measurements.

	M.
Length of cranium	0.115
Width of cranium at quadrates	0.080
Interorbital width of cranium	0.019
Greatest width of palatal fossa	0.036
Elevation of occiput	0.033
Length of mandible	0.075
Depth of mandible at symphysis	0.019
Length of plastron	0.615
Width at axillæ	0.360
Width at inguinal borders	0.310
Width between posterior apices	0.100
Width at base of anterior lip	0.125
Width at end of anterior lip	0.070
Length of anterior lip above	0.100
Length of an anterior marginal bone	0.075
Width of the same	0.100
Thickness of the same	0.034
Length of femur (condyles estimated)	0.170
Width of head plus great trochanter	0.090
Diameter of head	0.045
Diameter of shaft (least)	0.030

XEROBATES CYCLOPYGIUS, *sp. nov.*

This species was found by C. H. Sternberg in the horizon in which the preceding species was obtained. It resembles it in several important features; but as the skull is unknown, it is not certain that it belongs to the genus *Xerobates*.

The general form is round, the carapace being shortened behind, where its outline is a segment of a circle. The posterior marginal bones are vertical, and the edges are shortly recurved from one inguinal notch to the other. It resembles the *X. orthopygius* in the low buttresses which connect the base of the costal bones with the elevated inguinal margin of the hyposternal bone. The axillary margin of the hyosternal is not elevated. The posterior extremity of the plastron is openly notched. The anterior lip is unknown.

The carapace is flattened, but has a low tuberosity on the posterior part of the first vertebral scutum. In front of this, the superior surface descends to be again produced into the transverse flaring anterior lip-like border. The surface of the costal bones is marked by grooves concentric with the border of the carapace, which are separated by obtuse intervals wider than themselves. The plastron is marked by grooves parallel with the longitudinal and transverse sutures.

The scuta are well marked. The pectoral is very narrow. The nuchal is present and rather wide, and the vertebral scuta are quadrate in outline.

A number of specimens of this species was found, which vary somewhat in size.

Measurements.

No. 1.

	M.
Length of the posterior lobe of the plastron	0.140
Width of the posterior lobe of the plastron at the base	0.240

No. 2.

Length of the carapace (axial)	0.330
Width of the carapace at the front	0.320
Greatest elevation	0.015
Length of the nuchal scute	0.004
Length of the first vertebral	0.090
Width of the first vertebral	0.115
Width of the second vertebral	0.090
Length of the second vertebral	0.105

No. 3.

Length of the carapace behind the bridge	0.085
Width of the carapace at the bridge behind	0.240

The largest of these is smaller than the two specimens of the *X. orthopygius* which I have examined.

PSEUDEMYS HILLII, *sp. nov.*

This water-tortoise, from the same formation as the *Xerobates* above described, is nearly allied to the existing species *P. elegans* Wied. It is represented by a single specimen, which embraces nearly the whole plastron, with numerous portions of carapace, cranium, and limbs.

The vertebral bones preserved are nearly as wide as long, are narrowed posteriorly, and possess a smooth surface. The costals are united with the marginals by gomphosis. Their surface is marked by rather distinct and remote grooves, which are parallel to the circumference of the carapace. The marginals are smooth, and their edges are acute, very little recurved, and medially entire, or nearly so. There is a notch at the point of junction of several pairs of the median bones, while there is a rather deep notch at the middle of the anal marginal, which is also not recurved, but straight. The dermal sutures are well marked. The osseous surface is delicately crimped below the costo-marginal suture, the grooves of which assume an obliquely posterior direction on the posterior half of each marginal bone.

The lateral border of the posterior lobe of the plastron is gently convex to the end of the anal dermal suture, where it is slightly concave, but not notched. The posterior extremity is slightly emarginate, and the postabdominals are broadly rounded. The mesosternal bone is not deeply received into the hyosternals. The plastron is flat, and the lateral buttresses are low. The superior surfaces of the borders are but little thickened, and they pass gradually into the common surface of the plastron. The inferior surface exhibits a delicate grooving, which is parallel to the long axis of the animal; it is most distinct just behind the dermal cross-sutures. This species is about the size of the *Pseudemys elegans*. The typical specimen is adult.

Measurements.

	M.
Length of plastron minus clavicles (episternals)	0.165
Length of posterior lobe	0.075
Width of posterior lobe at base	0.090
Length of a vertebral bone	0.020
Width of the same	0.018
Length of a costal bone	0.019
Thickness of the same	0.0025
Length of anal marginal (lateral)	0.025
Width of anal marginal	0.022
Length of first marginal behind bridge	0.020
Width of first marginal behind bridge	0.029

This species differs from the *P. elegans* in the absence of the median emarginations of the posterior marginal bones; in the absence of notch of the posterior lobe of the plastron at the end of the anal suture; and in the general absence of ridges on the costal bones. The median notch of the anal marginal bone is more pronounced in the existing species.

This tortoise was discovered by Russell S. Hill, to whom it is dedicated.

ART. XVII.—NOTES ON A COLLECTION OF FISHES FROM THE RIO GRANDE, AT BROWNSVILLE, TEXAS.

By David S. Jordan, M. D.

A small jar of fishes collected at Brownsville, Texas, has been lately discovered in overhauling the collections of the United States National Museum. The name of the collector and the date of the collection are lost, and most of the specimens are in poor condition from long neglect; still a study of them has added something to our meagre knowledge of the fish-fauna of the Rio Grande. With one or two exceptions, the species have all been described by Girard, often under several different names, in the Ichthyology of the United States and Mexican Boundary.

Family CENTRARCHIDÆ.

Genus LEPIOPOMUS Rafinesque.

1.—Lepiopomus pallidus (Mitchill) Gill & Jordan.

1814—*Labrus pallidus* Mitchill, Trans. Lit. and Phil. Soc. N. Y. 407.
Lepomis pallidus Gill & Jordan (1877), Field and Forest, p. —.
Lepiopomus pallidus Jordan (1877), Ann. N. Y. Lyc. Nat. Hist. 316.
Helioperca pallida Jordan (1877), Ann. N. Y. Lyc. Nat. Hist. 355.
Lepiopomus pallidus Jordan (1877), Bull. U. S. Nat. Mus. x, 43.
Lepiopomus pallidus Jordan (1878), Man. Vert. ed. 2d, 241.
1818—*Labrus appendix* Mitchill, Am. Monthly Mag. v. 2, 247. (Not *Pomotis appendix* DeKay *et auct.* =*L. auritus* (L.) Raf.)
1831—*Pomotis incisor* Cuv. & Val. Hist. Nat. des Poissons, vii, 466.
Pomotis incisor DeKay (1842), N. Y. Fauna, Fishes, 33.
Pomotis incisor Storer (1846), Synopsis, 293.
Pomotis incisor Agassiz (1854), Am. Journ. Sci. Arts, 302.
Pomotis incisor Girard (1858), Pac. R. R. Survey, 24.
Pomotis incisor Günther (1859), Cat. Fishes, i, 259.
Ichthelis incisor Holbrook (1860), Ich. S. Car. 12.
Ichthelis incisor Putnam (1863), Bull. Mus. Comp. Zool. i, 6.
Lepomis incisor Gill (1864), Am. Journ. Sc. Arts, 93.
Lepomis incisor Cope (1865), Proc. Ac. Nat. Sc. Phil. 83.
Ichthelis incisor Jordan (1876), Man. Vert. 235, 317.
Ichthelis incisor Nelson (1876), Bull. Ills. Mus. Nat. Hist. 37.
Ichthelis incisor Jordan & Copeland (1876), Check List, 138.
1831—*Pomotis gibbosus* Cuvier & Valenciennes (1831), Hist. Nat. des Poissons, vii, 467.
Pomotis gibbosus Storer (1846), Synopsis Fishes N. A. 293.
1854—*Pomotis speciosus* Baird & Girard (1854), Proc. Ac. Nat. Sc. Phil. 24.
Pomotis speciosus Girard (1858), Pac. R. R. Surv. 23.
Pomotis speciosus Günther (1859), Cat. Fishes Brit. Mus. i, 263.

1854—*Lepomis speciosus* COPE (1870), Proc. Am. Philos. Soc. Phil. 453. (Excl. syn. *P. heros* Grd.)
Ichthelis incisor var. *speciosus* JORDAN (1876), Man. Vert. 236.
Ichthelis speciosus NELSON (1876), Bull. Ills. Nat. Hist. Soc. 37.
1857—*Pomotis luna* GIRARD, Proc. Ac. Nat. Sc. Phil. p. —.
Pomotis luna GIRARD (1858), U. S. Pac. R. R. Surv. x, 22. (Excl. syn. pars.)
1865—*Lepomis longispinis* COPE, Proc. Ac. Nat. Sc. Phila. 83.
Lepomis longispinis COPE (1868), Journ. Ac. Nat. Sc. Phila. 220.
1868—*Lepomis megalotis* COPE, Journ. Ac. Nat. Sc. Phila. 452.
Lepomis megalotis COPE (1870), Proc. Am. Philos. Soc. Phil. 452.
1868—*Lepomis ardesiacus* COPE, Journ. Ac. Nat. Sc. Phila. 222.
Lepomis ardesiacus COPE (1870), Proc. Am. Philos. Soc. 453.
1870—*Lepomis purpurascens* COPE (1870), Proc. Am. Philos. Soc. 453.

A single young specimen of this widely distributed species. There is no evident difference in the size of the spines between Texan and Northern individuals of this species if specimens of the same size are compared. As in other Sunfishes, young individuals have the spines proportionally higher.

Genus APOMOTIS Rafinesque.

2.—APOMOTIS CYANELLUS (Rafinesque) Jordan.

1818—*Sparus cyanelus* RAFINESQUE (1818), Am. Monthly Mag. 353. (Not described.)
1819—*Lepomis* (*Apomotis*) *cyanellus* RAF. Journ. de Physique, 419.
Icthelis (*Telipomis*) *cyanella* RAF. (1820), Ich. Ohiensis, 28.
Chænobryttus cyanellus JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 92.
Chænobryttus cyanellus JORDAN (1876), Man. Vert. 234.
Telipomis cyanellus NELSON (1876), Bull. Ills. Mus. Nat. Hist. 37.
Telipomis cyanellus JORDAN & COPELAND (1876), Check List, 137.
Apomotis cyanellus JORDAN (1877), Proc. Ac. Nat. Sc. Phila.
Apomotis cyanellus JORDAN (1877), Bull. U. S. Nat. Mus. ix, 19.
Apomotis cyanellus JORDAN (1877), Bull. U. S. Nat. Mus. x, p. 35.
Apomotis cyanellus JORDAN (1878), Man. Vert. ed. 2d, 239.
1820—*Icthelis melanops* RAF. Ich. Oh. 28.
Chænobryttus melanops COPE (1865), Proc. Ac. Nat. Sc. Phil. 84.
Lepomis melanops COPE (1868), Journ. Ac. Nat. Sc. Phil. 223.
Chænobryttus melanops COPE (1870), Proc. Am. Philos. Soc. Phil. 452.
Chænobryttus cyanellus var. *melanops* JORDAN (1876), Man. Vert. 234.
1831—*Bryttus punctatus*, CUV. & VAL. Poissons, vii, 347.
Bryttus punctatus STORER (1846), Synopsis, 295.
Bryttus punctatus GÜNTHER (1859), Cat. Fishes Brit. Mus. i, 259.
1853—*Pomotis longulus* BAIRD & GIRARD, Proc. Ac. Nat. Sc. Phil. 391.
Pomotis longulus BAIRD & GIRARD (1853), Marcy Red R. Expl. 245.
Bryttus longulus BAIRD & GIRARD (1854), Proc. Ac. Nat. Sc. Phil. 25.
Calliurus longulus GIRARD (1858), Pac. R. R. Surv. x, 16.
Calliurus longulus GIRARD (1859), U. S. Mex. Bound. Surv. Ichth. 5.
1857—*Calliurus diaphanus* GIRARD, Proc. Ac. Nat. Sc. Phil. p. —.
Calliurus diaphanus GIRARD (1858), Pac. R. R. Surv. x, 13.
1857—*Calliurus formosus* GIRARD, Proc. Ac. Nat. Sc. Phil. p. —.
Calliurus formosus GIRARD (1858), Pac. R. R. Surv. 14.
1857—*Calliurus microps* GIRARD, Proc. Ac. Nat. Sc. Phil. p. —.
Calliurus microps (1858), Pac. R. R. Surv. 17.
Telipomis microps NELSON (1876), Bull. Ills. Mus. Nat. Hist. 37.

1857—*Calliurus murinus* GIRARD (1857), Proc. Ac. Nat. Sc. Phil. p. —.
Calliurus murinus GIRARD (1858), Pac. R. R. Surv. 18.
1864—*Bryttus mineopas* COPE, Proc. Ac. Nat. Sc. Phil. 84.
Lepomis mineopas COPE (1868), Journ. Ac. Nat. Sc. Phil. 224.
Chænobryttus mineopas COPE (1870), Proc. Am. Philos. Soc. 452.

Several young specimens of this widely diffused species.

Family LABRIDÆ. (?)

A very young specimen of some genus unknown to me, apparently *Labroid*. There are about fifteen spines in the single dorsal fin, and a less number of soft rays. In the anal fin are three stout spines, the second decidedly longest. The lateral line runs very high, concurrent with the back. The teeth are large and conical. The general aspect is sparoid. The specimen is so small that I have not attempted further to ascertain its relations.

Family GOBIIDÆ. (?)

Genus SEMA Jordan (*gen. nov.*).

3.—SEMA SIGNIFER Jordan (*sp. nov.*).

A small fish in this collection has puzzled me very much. Its affinities are apparently *Gobioid*, but it seems to bear little resemblance to any of the current genera of that family, nor am I able, in any of the books accessible to me, to find any account of any fish to which it bears any special resemblance. It is possible that it has been described already in some work with which I am not acquainted, or that its affinities are remote from those species with which I have compared it. After consideration, however, I have thought best to make the species known, even though my knowledge of its structure is incomplete, for the characters of the species are so marked that whoever finds a second specimen will have no difficulty in identifying it from the present description. I shall not attempt at present to separate the generic from the specific characters. The name suggested for the genus is from σῆμα, a banner, in allusion to the high fins.

Body oblong, moderately elevated, greatly compressed, the depth 3¾ in length, the caudal peduncle rather deep, the greatest depth of body being opposite the vent, which is midway between the snout and the base of the caudal. The compression of the body in the type-specimen is excessive, but this may be in part due to its soft condition. Head large, 4 in length to the base of the caudal, compressed, nearly circular in outline, the snout extremely gibbous, the interorbital space narrow and almost carinated. Mouth very small, terminal oblique, the maxillary not reaching to the front of the eye; jaws equal when the mouth is closed; teeth, if present, not evident; eye large, longer than snout, about 3 in head; opercular bones rather narrow, with entire edges, the preoperculum forming a broad arc. more nearly horizontal in position than is usual; operculum striated; the head in the typical specimen entirely scaleless.

Gill-openings wide, the gill-membranes not much connected below.

Scales quite small, not closely imbricated, seemingly partly imbedded in the skin; lateral line obscure, nearly straight, the number of scales included in it not ascertainable. Dorsal fin single, beginning just behind the head, the length of its base just half the length of the fish from snout to base of caudal. It consists of about eight flexible spines, gradually increasing in length backward. There are about fifteen soft rays, which are much higher than the spines, also increasing in height backward. The condition of the specimen renders it impossible to exactly count either soft rays or spines without danger of breaking them. The above count, as well as that of the anal and ventral fins is only an approximation, made by counting the bases of the rays. The last and longest ray of the dorsal is about two-fifths of the length of the fish from the snout to the base of the caudal. The anal fin is a little shorter than the dorsal, and consists of about two spines and some eighteen or twenty soft rays. The form of the fin is similar to that of the dorsal, and the hinder part of the fin is similarly elevated, the longest rays being about two-fifths as long as the fish.

Caudal fin greatly elongated, rounded or lanceolate in outline, produced behind, its length nearly half that of the rest of the fish.

Ventral fins thoracic, apparently 1, 5, and apparently united into one. I regret that this important matter cannot be certainly decided. When first examined, the two were united into one lanceolate fin, but in handling they were split apart, apparently not naturally, but the possibility remains that they were merely stuck together by some adhesive substance. At all events, the two were very close together, and the bases still seem to be connected. Pectorals rather narrow, apparently short; the ends, however, broken; their position as in percoid fishes.

Colors vanished. In spirits, at present, uniform pale.

Length of typical specimen two inches. It is in good condition, every part being present, but like most museum specimens it has become extremely soft. I have not attempted to dissect the fish as I do not wish to destroy or injure it, and I therefore leave for future investigation the determination of its affinities, referring it provisionally to the *Gobiidæ*, on the ground of the apparent cohesion of the ventrals.

Family CYPRINODONTIDÆ.

Genus HYDRARGYRA Lacépède.

4.—HYDRARGYRA SIMILIS Baird & Girard.

1853—*Hydrargyra similis* BAIRD & GIRARD, Proc. Ac. Nat. Sc. Phila. 389.
Hydrargyra similis GIRARD (1859), U. S. and Mex. Bound. Ichth. 68, pl. 35, f. 1-8.
? *Fundulus similis* GÜNTHER (1866), Cat. Fishes Brit. Mus. vi, 323.

Several small female specimens, stout and full-bodied. They agree closely with Girard's description and figure, but not very well with

Günther's account, especially in regard to the position of the dorsal. There seem to be eleven rays in the anal. The number of branchiostegals is apparently six; the species is therefore a *Hydrargyra*, and not a *Fundulus*, as those genera are now understood.

Family CYPRINIDÆ.

Genus CAMPOSTOMA Agassiz.

5.—CAMPOSTOMA FORMOSULUM Girard.

1856—*Campostoma formosulum* GIRARD, Proc. Ac. Nat. Sc. Phila. 176.
Campostoma formosulum GIRARD (1859), U. S. Mex. Bound. Sur. Ichthyol. 41, pl. 25, f. 5–8.
Campostoma formosulum JORDAN & COPELAND (1876), Check List, 146.

A single specimen of a *Campostoma*, with a rather long and pointed head. Its scales are rather large, 51 in the lateral line. It agrees well with Girard's figure and description, but the points of distinction between the species and the common *C. anomalum* are not evident.

Genus HYBOGNATHUS Agassiz.

(*Hybognathus*, *Algoma*, and *Dionda* Girard.)

6.—HYBOGNATHUS AMARUS (Girard) Jordan.

1856—*Algoma amara* GIRARD, Proc. Ac. Nat. Sc. Phila. 181.
Algoma amara GIRARD (1859), U. S. and Mex. Bound. Surv. Ichthyol. 45, pl. 27, f. 17–20.
Algoma amara JORDAN & COPELAND (1876), Check List, 150.

Several specimens of a small, pale, large-scaled species of *Hybognathus*, very similar to *H. nuchalis* Ag., and agreeing well with Girard's figure and description. Lateral line 36 to 38. The genera *Algoma* and *Dionda* do not differ in any tangible respect from *Hybognathus*, and, until some good distinctive character is found, should be reunited with it. The species of *Dionda* and *Algoma* are generally small and thick-bodied, and Girard's typical series of teeth, preserved in the National Museum, show the teeth of *Dionda* as generally shorter proportionally than those of *Hybognathus*. In this respect, as well as in the form of the body, *Algoma* is intermediate.

7.—HYBOGNATHUS SERENUS (Girard) Jordan.

1856—*Dionda serena* GIRARD, Proc. Ac. Nat. Sc. Phila. 177.
Dionda serena GIRARD (1859), U. S. Mex. Bound. Surv. Ich. 42, pl. 26, f. 9–12.
Dionda serena JORDAN & COPELAND (1876), Check List, 147.
1856—*Dionda texensis* GIRARD, Proc. Ac. Nat. Sc. Phila. 177.
Dionda texensis GIRARD (1859), U. S. Mex. Bound. Surv. Ich. 42, pl. 26, f. 21–24.
Dionda texensis JORDAN & COPELAND (1876), Check List, 147.

1856—*Dionda argentosa* GIRARD, Proc. Ac. Nat. Sc. Phila. 178.
Dionda argentosa GIRARD (1859), U. S. Mex. Bound. Survey, Ichth. 43, pl. 26, f. 5-8.
Dionda argentosa JORDAN & COPELAND (1876), Check List, 147.
1856—*Dionda chrysitis* GIRARD, Proc. Ac. Nat. Sc. Phil. 178.
Dionda chrysitis GIRARD (1859), U. S. Mex. Bound. Surv. Ichthy. 43, pl. 26, f. 13-16.
Dionda chrysitis JORDAN & COPELAND (1876), Check List, 147.
1856—*Dionda papalis* GIRARD, Proc. Ac. Nat. Sc. Phil. 178.
Dionda papalis GIRARD (1859), U. S. Pac. R. R. Surv. x, 228.
Dionda papalis JORDAN & COPELAND (1876), Check List, 147.

Numerous specimens of a slender, silvery species of *Hybognathus*, agreeing equally well in all essential particulars with all of Girard's descriptions and figures above cited. I therefore unite them all under the oldest name, without much hesitation, as even if other species of the group called *Dionda* occur, we cannot safely refer them to any one of Dr. Girard's species more than to another, except in those few cases where the typical examples have been preserved. *H. episcopus*, *spadiceus*, *plumbeus*, and *melanops* are apparently species distinct from *serenus*. Some of the species called *Hyborhynchus* may prove to belong to *Hybognathus*.

8.—HYBOGNATHUS MELANOPS (Girard) Jordan.

1856—*Dionda melanops* GIRARD, Proc. Ac. Nat. Sc. Phila. 178.
Dionda melanops GIRARD (1859), U. S. and Mex. Bound. Surv. Ichthy. 44, pl. 26, f. 17-20.
Dionda melanops JORDAN & COPELAND (1876), Check List, 147.
1856—*Dionda couchi* GIRARD, Proc. Ac. Nat. Sc. Phila. 178.
Dionda couchi GIRARD (1859), U. S. and Mex. Bound. Surv. Ich. 44, pl. 26, f. 1-4.
Dionda couchii JORDAN & COPELAND (1876), Check List, 147.

Numerous specimens of a short, compressed, and deep-bodied species, apparently identical with Girard's *melanops* and *couchi*.

Genus PIMEPHALES Rafinesque.

9.—PIMEPHALES PROMELAS Rafinesque.

1820—*Pimephales promelas* RAF. Ich. Oh. 94.
Pimephales promelas KIRTLAND (1838), Rep. Zool. Oh. 194.
Pimephales promelas KIRTLAND (1838), Bost. Journ. Nat. Hist. iii, 475.
Pimephales promelas STORER (1846), Syn. 418.
Pimephales promelas AGASSIZ (1855), Amer. Journ. Sci. Arts, 220.
Pimephales promelas PUTNAM (1863), Bull. M. C. Z. 8.
Pimephales promelas GÜNTHER (1868), Cat. Fishes, vii, 181.
Pimephales promelas JORDAN (1874), Ind. Geol. Surv. 224.
Pimephales promelas JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 94.
Pimephales promelas JORDAN (1876), Man. Vert. 275.
Pimephales promelas JORDAN & COPELAND (1876), Check List, 146.
Pimephales promelas NELSON (1876), Bull. Ills. Soc. Nat. Hist. 45.
Pimephales promelas JORDAN (1877), Bull. U. S. Nat. Mus. ix, 32.
1856—*Pimephales maculosus* GIRARD, Proc. Phil. Ac. Sc. 180.
1858—*Pimephales maculosus* GIRARD, Pac. R. R. Surv. x, 234.
1858—*Pimephales fasciatus* GIRARD, Pac. R. R. Surv. x, 234.

1860—*Plargyrus melanocephalus* ABBOTT, Proc. Phil. Ac. Sc. 325.
Pimephales melanocephalus JORDAN & COPELAND (1876), Check List, 146.
1864—*Pimephales milesii* COPE, Proc. Ac. Sc. Phila. 282.
Pimephales milesii GÜNTHER (1868), Cat. Fishes, vii, 181.
Pimephales milesii JORDAN (1876), Man. Vert. 276.
1866—*Pimephales agassizii* COPE, Cyp. Penn. 391.
Pimephales agassizii JORDAN (1874), Ind. Geol. Surv. 224.

A few specimens apparently identical with others from the Ohio River. This species, like *Lepiopomus pallidus*, *Apomotis cyanellus*, *Campostoma anomalum*, *Notemigonus chrysoleucus*, and *Amiurus natalis*, mentioned in this paper, is one of those widely diffused and variable species the occurrence of which almost anywhere east of the Pacific slope need not surprise any one.

Genus ALBURNOPS Girard.

(*Hybopsis* of Cope, etc., but probably not of Agassiz.)

10.—ALBURNOPS MISSURIENSIS (Cope) Jordan.

1872—*Hybopsis missuriensis* COPE, Hayden Survey Wyoming, 1870, 437.
Hybopsis missouriensis JORDAN & COPELAND (1876), Check List, 150.
Hybopsis missuriensis JORDAN (1878), Man. Vert. ed. 2d, 291.

Numerous specimens, agreeing closely with Professor Cope's description, except that the distended stomachs make the apparent depth proportionally greater. The teeth are 4—4, with strong masticatory surface; the scales are extremely large, 5—30—3. The mouth is oblique in position and scarcely inferior. The dorsal fin is over the ventrals. In color, these specimens are pale and silvery.

Genus CYPRINELLA Girard.

11.—CYPRINELLA BUBALINA (Baird & Girard) Girard.

1853—*Leuciscus bubalinus* B. & G. Proc. Ac. Nat. Sc. Phila. 391.
Leuciscus bubalinus B. & G. (1853), Marcy Explor. Red. R. 249, pl. 14, f. 5–8.
Cyprinella bubalina GIRARD (1856), Proc. Ac. Nat. Sc. Phila. 197.
Cyprinella bubalina GIRARD (1858), U. S. Pac. R. R. Expl. 266.
Cyprinella bubalina JORDAN & COPELAND (1876), Check List, 153.
1856—*Cyprinella umbrosa* GIRARD, Proc. Ac. Nat. Sc. Phila. 197.
Cyprinella umbrosa GIRARD (1858), U. S. Pac. R. R. Expl. 266, pl. 58, f. 1-5.
Cyprinella umbrosa JORDAN & COPELAND (1876), Check List, 153.

Many specimens of a very deep-bodied species of *Cyprinella*, agreeing well with both *C. bubalina* and *C. umbrosa* of Girard. As my specimens can be readily identified with either, I unite the two nominal species in the above synonymy. The male specimens have the snout profusely tuberculate. The teeth are 1, 4—4, 1, slightly crenate.

Genus NOTEMIGONUS Rafinesque.

12.—NOTEMIGONUS CHRYSOLEUCUS (Mitchill) Jordan.

1814—*Cyprinus chrysoleucus* MITCH. Rept. Fishes N. Y. 23.
Cyprinus chrysoleucus MITCH. (1815), Trans. Lit. and Phil. Soc. i, 459.
Cyprinus chrysoleucas MITCH. (1815), Trans. Lit. and Phil. Soc. i, 459,
Rutilus chrysoleucas RAF. (1820), Ich. Oh. 48.
Cyprinus (*Leuciscus*) *chrysoleucus* RICH. (1837), Fauna Bor.-Am. iii, 122.
Leuciscus chrysoleucus STORER (1839), Rept. Fishes Mass. 88.
Leuciscus chrysoleucus THOMPSON (1842), Hist. Vermont, 136.
Leuciscus chrysoleucus KIRTLAND (1843), Bost. Journ. Nat. Hist. iv, 305.
Notemigonus chrysoleucus JORDAN (1877), Bull. U. S. Mus. x, 65.
Notemigonus chrysoleucus JORDAN (1878), Man. Vert. ed. 2d, 301.
1820—*Notemigonus auratus* RAF. Ich. Oh. 40.
1842—*Abramis versicolor* DEKAY, Fishes N. Y. 191.
Leuciscus versicolor STORER (1846), Syn. 415.
Stilbe versicolor AGASSIZ (1854), Am. Journ. Sc. Arts, 359.
1845—*Leuciscus obesus* STORER, Proc. Bost. Soc. Nat. Hist. July p. —.
Leuciscus obesus STORER (1846), Synopsis, 418.
Stilbe obesa AGASSIZ (1854), Am. Journ. Sc. Arts, 359.
Luxilus obesus GIRARD (1856), Proc. Phila. Ac. Sc. 203.
1846—*Leuciscus americanus* STORER, Syn. 408.
Leucosomus americanus GIRARD (1853), Storer Fishes Mass. 283.
Luxilus americanus GIRARD (1856), Proc. Phila. Ac. Sc. 203.
Plargyrus americanus PUTNAM (1863), Bull. M. C. Z. 7.
Stilbius americanus GILL (1865), Can. Nat. Aug. 18.
Stilbius americanus JORDAN (1874), Ind. Geol. Surv. 224.
Stilbe americana COPE (1866), Cyp. Penn. 389.
Stilbe americana ABBOTT (1870), Am. Nat. 14.
Stilbe americana GOODE (1876), Bull. U. S. Museum, vi, 64.
Abramis americanus GÜNTHER (1868), Cat. Fishes, vii, 305.
Notemigonus americana JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 93.
Notemigonus americana JORDAN (1876), Man. Vert. 291.
Notemigonus americana NELSON (1876), Bull. Ills. Mus. 48.
Stilbe americana UHLER & LUGGER (1876), Fishes of Maryland, 145.
Notemigonus americanus JORDAN & COPELAND (1876), Check List, 155.
Notemigonus americanus JORDAN (1877), Ann. N. Y. Lyc. Nat. Hist. 344.
1856—*Luxilus seco* GIRARD, Proc. Phil. Ac. Sc. 203.
Luxilus seco GIRARD (1858), Pac. R. R. Surv. 281.
Notemigonus seco JORDAN & COPELAND (1876), Check List, 155.
Notemigonus seco JORDAN (1877), Ann. N. Y. Lyc. 365.

A single rather large specimen, apparently identical with the common Northern species. *Luxilus seco* of Girard does not differ in any tangible way, and may be considered a synonym. The relative size of the eye varies too much with age to be very reliable as a specific character when other characters fail.

Family CATOSTOMIDÆ.

Genus CARPIODES Rafinesque.

13.—CARPIODES TUMIDUS Baird & Girard.

1854—*Carpiodes tumidus* BAIRD & GIRARD, Proc. Ac. Nat. Sc. Phila. 28.
Ictiobus tumidus GIRARD (1859), U. S. Mex. Bound. Surv. Ich. 34, pl. xix, f. 1-4.
Ichthyobus tumidus JORDAN & COPELAND (1876), Check List, 158.

1870—*Carpiodes grayi* COPE, Proc. Am. Philos. Soc. Phila. 482.
Carpiodes grayi JORDAN & COPELAND (1876), Check List, 158.
Carpiodes grayi COPE & YARROW (1876), Lieut. Wheeler's Expl. W. 100th Meridian, 681.

Numerous partly grown specimens answering well both to Girard's and Cope's descriptions, the habitat of Professor Cope's species (Rio Grande) heightening the probability of the correctness of the identification. Girard's original types of *tumidus* were from Brownsville.

Family SILURIDÆ.

Genus AMIURUS Rafinesque.

14.—AMIURUS NATALIS (Le Sueur) Gill.

Var. ANTONIENSIS (Girard) Jordan.

Var. *natalis*.

1819—*Pimelodus natalis* LE SUEUR, Mém. du Muséum, v, 154.
Pimelodus natalis STORER (1846), Synopsis, 405.
Amiurus natalis GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Amiurus natalis GÜNTHER (1864), Col. Fishes Brit. Mus. v, 101.
Aniurus natalis JORDAN (1877), Bull. U. S. Nat. Mus. x, 86.
1859—*Pimelodus puma* GIRARD, Proc. Acad. Nat. Sci. Phila. 160.

Var. *lividus*.

1820—*Silurus lividus* RAF. Quart. Journ. Sci. Lit. Arts London, 48 (et var. *fuscatus*).
Pimelodus lividus RAF. (1820), Ich. Oh. 65.
Amiurus lividus JORDAN (1876), Man. Vert. 302.
Amiurus lividus JORDAN & COPELAND (1876), Check List, 159.
1858—*Pimelodus felinus* GIRARD, U. S. Pac. R. R. Expl. x, 209.
Amiurus felinus GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Amiurus felinus COPE (1870), Proc. Am. Philos. Soc. 485.
Amiurus felinus JORDAN & COPELAND (1876), Check List, 159.
1859—*Pimelodus catus* GRD. (1859), Proc. Phila. Acad. Nat. Sci. 160. (Not of DeKay and most authors.)
Amiurus catus COPE (1870), Proc. Am. Philos. Soc. 484.
1859—*Pimelodus cupreoides* GRD. Proc. Acad. Nat. Sci. Phila. 159.
Amiurus cupreoides GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Var. *cupreus*.

1820—*Silurus cupreus* RAF. Quart. Journ. Sci. Lit. Arts London, 51.
Pimelodus (*Amiurus*) *cupreus* RAF. (1820), Ich. Oh. 65.
Pimelodus cupreus KIRT. (1838), Rept. Zoöl. Oh. 169, 194.
Pimelodus cupreus KIRT. (1846), Bost. Journ. Nat. Hist. iv, 333.
Pimelodus cupreus DEKAY (1842), Fishes N. Y. 187.
Pimelodus cupreus STORER (1846), Synopsis, 404.
Pimelodus cupreus GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
Amiurus cupreus GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Amiurus cupreus COPE, Proc Am. Philos. Soc. 485.
Amiurus cupreus JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 50.
Amiurus cupreus JORDAN (1876), Man. Vert. 303.
Amiurus cupreus NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.
Amiurus cupreus JORDAN & COPELAND (1876), Check List, 159.
Amiurus cupreus JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. 351.
Amiurus cupreus JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.
Amiurus cupreus COPE (1865), Proc. Acad. Nat. Sci. Phila. 276.

Var. *cœnosus.*

1836—*Silurus* (*Pimelodus*) *cœnosus* RICH. Fauna, Bor.-Amer. Fishes, p. 132.
Silurus (*Pimelodus*) *cœnosus* CUV. & VAL. (1840), xv, 29.
Silurus (*Pimelodus*) *cœnosus* DEKAY (1842), Fishes N. Y. 186.
Silurus (*Pimelodus*) *cœnosus* STORER (1846), Synopsis, 402.
Amiurus cœnosus GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Amiurus cœnosus COPE (1870), Proc. Am. Philos. Soc. 485.
Amiurus cœnosus JORDAN (1876), Man. Vert. 303.
Amiurus cœnosus JORDAN & COPELAND (1876), Check List, 159.

Var. *antoniensis.*

1859—*Pimelodus antoniensis* GRD. Pac. R. R. Expl. x, 291.
Amiurus antoniensis GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Amiurus antoniensis COPE (1870), Proc. Am. Philos. Soc. 485.

Var. *analis.*

1877—*Amiurus natalis* subspecies *analis* JORDAN (1877), Bull. U. S. Nat. Mus. x, 87.

Several young specimens of the Southwestern variety (*antoniensis*) of this most widely diffused species. The differences separating this form from the variety *cupreus* are very slight.

ART. XVIII.—A CATALOGUE OF THE FISHES OF THE FRESH WATERS OF NORTH AMERICA.

BY DAVID S. JORDAN, M. D.

The following catalogue embraces all those species of fishes thus far known to inhabit the fresh waters of North America, including that part of Mexico which is similar in its faunal characteristics to neighboring portions of the United States. It may be considered as a new edition of Jordan and Copeland's Check List,* as it covers essentially the same ground. The work has been, however, entirely recast, and brought up to date, so as to include the results of the author's own studies, and those of other writers so far as the latter have been made known.

The classification, as regards the families and higher groups, is throughout that of Professor Gill. It has seemed best to adopt this arrangement, rather than that of any other author, if for no other reason, that the present catalogue may be readily compared with Professor Gill's Catalogue of the Fishes of the East Coast of North America.

The order of the forms has, however, been reversed, as it seems decidedly more philosophic to arrange them in an ascending series, beginning with the most generalized forms, and ending with those "higher", or more specialized.

I have included all the species of *Salmonidæ*, *Cyprinodontidæ*, *Gasterosteidæ*, and of some other groups, members of which inhabit both salt and fresh waters, and I have excluded the *Gobiidæ*, *Belonidæ*, etc., some of which ascend fresh waters from the sea. Any line drawn between fresh-water and salt-water fishes must be an arbitrary one, and I have preferred to draw it between the Cyprinodonts and the Gobies.

This list includes all those species which have proved, on full examination, to be valid, in our present understanding of "valid" species, and also such of the dubious or unverified species which appear to have, on balancing the chances, a reasonable probability in their favor. Species against which the balance of probabilities appears to lie have been generally omitted. In certain genera, chiefly Southwestern, *e. g.* *Cyprinella*, *Gila*, *Notropis*, where many species were originally described in a loose fashion, and where no examination of typical examples has been made, it has been necessary to include all the species described, in spite of the probability that not half of them are valid—as we have no means of determining *which* half. I hope, however, soon to be able to examine the original typical specimens, or, still better, to make further collections in the same localities.

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* Check List of the Fishes of the Fresh Waters of North America, by David S. Jordan and Herbert E. Copeland. < Bulletin Buffalo Society of Natural History, 1876, pp. 133-164.

In case of species which are for various reasons considered doubtful, the nature of the doubt has been indicated as follows: *d. s.*, a doubtful species; *d. a. s.*, doubtful as to species, *i. e.*, doubt as to correctness of identification; *d. g.*, doubtful as to genus. Species so loosely described as to be of uncertain genus are, however, generally omitted.

Varieties or subspecies have been generally omitted. There can be no doubt that a full study of our fishes will necessitate the recognition by name of varieties or subspecies, whatever called, in the case of nearly every widely diffused form. In very few cases, however, have these received names, except incidentally when described as new species, and in still fewer have they been properly limited and defined. Their study and definition are therefore a matter for future work.

The number of nominal species included in this catalogue is 665, which are distributed in 157 genera. In Jordan and Copeland's Check List, the number of species is about 670, arranged in 150 genera. The total number of admitted species therefore has been slightly diminished (the ground covered in this list being greater), although upward of forty new species have been added since the publication of the first list. The reduction has been chiefly in the *Salmonidæ*, *Siluridæ*, and *Catostomidæ*. A considerable number of species doubtless remains to be discovered in the Southern and Southwestern parts of the United States, particularly in the ponds and bayous of the lowlands, while the number of species of *Cyprinidæ* and *Cyprinodontidæ* must be further reduced. The total number of species will therefore not vary far from 680. The number of genera admitted has been steadily increasing, and will probably in time reach about 200, unless succeeding ichthyologists adopt a different standard of generic values from that which at present obtains. Subgenera have been recognized for the more strongly marked sections, and several new ones have been here indicated, most of which, however, need no distinctive name.

TABLE OF CLASSIFICATION.

Class MARSIPOBRANCHII.

Order Hyperoartia.

Suborder.	Family.	Genus.	Type-species.
—	Petromyzontidæ (1).	1. Ammocœtes.	branchialis (*Europe*).
		2. Entosphenus.	tridentatus.
		3. Petromyzon.	marinus.

Class PISCES.

Subclass GANOIDEI.

Order Chondrostei.

—	Acipenseridæ (2).	4. Acipenser.	sturio (*marine*).
		5. Scaphirhynchops.	platyrhynchus.

Order Selachostomi.

	Polyodontidæ (3).	6. Polyodon.	folium.

Order Rhomboganoidei.

	Lepidosteidæ (4).	7. Lepidosteus.	osseus.
		Cylindrosteus.	platystomus.
		8. Litholepis.	spatula.

Order Cycloganoidei.

	Amiidæ (5).	9. Amia.	calva.

Subclass TELEOSTEI.

Order Apodes.

	Anguillidæ (6).	10. Anguilla.	vulgaris.

Order Nematognathi.

	Siluridæ (7).	11. Noturus.	flavus.
		Schilbeodes.	gyrinus.
		12. Pelodichthys.	olivaris.
		13. Amiurus.	natalis.
		14. Ichthælurus.	punctatus.

Order Teleocephali.

Eventognathi.	Catostomidæ (8).	15. Bubalichthys.	urus.
		16. Ichthyobus.	bubalus.
		17. Carpiodes.	cyprinus.
		18 Cycleptus.	elongatus.
		19. Pantosteus.	platyrhynchus.
		20. Catostomus.	longirostris.
		Decadactylus.	commersoni.
		Hypentelium.	nigricans.

Suborder.	Family.	Genus.	Type-species.
Eventognathi.	Catostomidæ (8).	21. Chasmistes.	fecundus.
		22. Erimyzon.	sucetta.
		23. Minytrema.	melanops.
		24. Myxostoma.	anisurum.
		25. Placopharynx.	carinatus.
		26. Quassilabia.	lacera.
	Cyprinidæ (9).	27. Exoglossum.	maxillilingua.
		28. Campostoma.	anomalum.
		29. Acrochilus.	alutaceus.
		30. Orthodon.	microlepidotus.
		31. Hybognathus.	nuchalis.
		Algoma.	amarus.
		Dionda.	episcopus.
		32. Coliscus.	parietalis.
		33. Pimephales.	promelas.
		34. Hyborhynchus.	notatus.
		35. Cochlognathus.	ornatus.
		36. Alganseа.	tincella.
		37. Alburnops.	blennius.
		Hudsonius.	hudsonius.
		Hydrophlox.	rubricroceus.
		38. Luxilus.	cornutus.
		Photogenis.	anulostanus (spilopterus).
		39. Lythrurus.	diplæmius.
		40. Cyprinella.	bubalina.
		Moniana.	lutrensis.
		41. Codoma.	ornata.
		Erogala.	stigmatura.
		42. Notropis.	atherinoides.
		43. Cliola.	vigilax.
		Episema.	scabriceps.
		44. Ericymba.	buccata.
		45. Protoporus.	domninus.
		46. Hemitremia.	vittata.
		47. Chrosomus.	erythrogaster.
		48. Phoxinus.	lævis (*Europe*).
		49. Gila.	robusta.
		Tigoma.	pulchella.
		Clinostomus.	elongata.
		Ptychochilus.	oregonensis.
		50. Siboma.	crassicauda.
		51. Myloleucus.	pulverulentus.
		52. Cheonda.	cooperi.
		53. Lavinia.	exilicauda.
		54. Notemigonus.	chrysoleucus.
		55. Richardsonius.	balteatus.
		56. Phenacobius.	teretulus.
		57. Rhinichthys.	atronasus.
		58. Apocope.	carringtoni.
		Eritrema.	henshawi.
		59. Ceratichthys.	biguttatus.
		60. Semotilus.	corporalis.
		Leucosomus.	bullaris.
		61. Agosia.	chrysogaster.
		62. Pogonichthys.	inæquilobus.

Suborder.	Family.	Genus.	Type-species.
Eventognathi.	Cyprinidæ (9).	63. Platygobio.	gracilis.
		64. Mylochilus.	caurinus.
		65. Mylopharodon.	conocephalus.
		66. Tiaroga.	cobitis.
		67. Graodus.	nigrotæniatus.
		68. Lepidomeda.	vittata.
		69. Meda.	fulgida.
		70. Plagopterus.	argentissimus.
Isospondyli.	Dorysomatidæ (10).	71. Dorysoma.	heterurum.
	Clupeidæ (11).	72. Alosa.	vulgaris (*Europe*).
		73. Pomolobus.	chrysochloris.
		Meletta.	sprattus (*Europe*).
	Hyodontidæ (12).	74. Hyodon.	tergisus.
		Elattonistius.	chrysopsis.
	Microstomatidæ (13).	75. Osmerus.	eperlanus (*Europe*).
		76. Mallotus.	villosus.
	Salmonidæ (14).	77. Coregonus.	lavaretus (*Europe*).
		Prosopium.	quadrilateralis.
		Argyrosomus.	artedi.
		Allosomus.	tullibee.
		78. Stenodus.	mackenzii.
		79. Thymallus.	vulgaris (*Europe*).
		80. Salvelinus.	distichus (*Europe*).
		81. Cristivomer.	namaycush.
		82. Salar.	fario (*Europe*).
		83. Salmo.	salar.
		84. Oncorhynchus,	keta.
		Hypsifario.	kennerlyi.
	Characinidæ (15).	85. Astyanax.	argentatus.
	Percopsidæ (16).	86. Percopsis.	guttatus.
Haplomi.	Esocidæ (17).	87. Esox.	lucius.
		Mascalongus.	nobilior.
		Picorellus.	salmoneus.
	Amblyopsidæ (18).	88. Chologaster.	cornutus.
		89. Typhlichthys.	subterraneus.
		90. Amblyopsis.	spelæus.
	Umbridæ (19).	91. Melanura.	limi.
	Cyprinodontidæ (20).	92. Cyprinodon.	variegatus.
		93. Girardinichthys.	innominatus.
		94. Lucania.	venusta.
		95. Hydrargyra.	swampina.
		96. Fundulus.	heteroclitus.
		97. Xenisma.	stelliferum.
		98. Zygonectes.	notatus.
		Micristius.	zonatus.
		99. Gambusia.	punctata (*Cuba*).
		100. Mollienesia.	latipinna.
		101. Girardinus.	uninotatus (*Cuba*).
		102. Adinia.	multifasciata.
Percesoces.	Atherinidæ (21).	103. Chirostoma.	———
		104. Atherina.	presbyter (*Europe*).
		105. Labidesthes.	sicculus.
Acanthopteri.	Aphododeridæ (22).	106. Aphododerus.	sayanus.
	Elassomatidæ (23).	107. Elassoma.	zonatum.

Suborder.	Family.	Genus.	Type-species.
Acanthopteri.	Centrarchidæ (24).	108. Micropterus.	salmoides.
		109. Chænobryttus.	gulosus.
		110. Ambloplites.	rupestris.
		Archoplites.	interruptus.
		111. Acantharchus.	pomotis.
		112. Apomotis.	cyanellus.
		113. Lepiopomus.	auritus.
		Helioperca.	pallidus.
		114. Xystroplites.	gillii.
		115. Xenotis.	fallax.
		116. Eupomotis.	aureus.
		117. Mesogonistius.	chætodon.
		118. Enneacanthus.	obesus.
		119. Hemioplites.	simulans.
		120. Copelandia.	eriarcha.
		121. Centrarchus.	irideus.
		122. Pomoxys.	annularis.
		Hyperistius.	nigromaculatus.
	Labracidæ (25).	123. Morone.	americana.
		124. Roccus.	lineatus.
		Lepibema.	chrysops.
	Percidæ (26).	125. Perca.	fluviatilis (*Europe*).
		126. Stizostethium.	salmoneum.
		Cynoperca.	canadense.
	Etheostomatidæ (27).	127. Ammocrypta.	beanii.
		128. Pleurolepis.	pellucidus.
		129. Percina.	caprodes.
		130. Alvordius.	maculatus.
		131. Ericosma.	evides.
		132. Hadropterus.	nigrofasciatus.
		133. Imostoma.	shumardi.
		134. Rheocrypta.	copelandi.
		135. Diplesium.	blennioides.
		136. Ulocentra.	atripinnis.
		137. Boleosoma.	olmstedi.
		138. Nanostoma.	zonale.
		139. Nothonotus.	maculatus.
		140. Pœcilichthys.	variatus.
		141. Etheostoma.	flabellare.
		142. Alvarius.	lateralis.
		143. Boleichthys.	exilis.
		144. Microperca.	punctulata.
	Sciænidæ (28).	145. Haploidonotus.	grunniens.
		146. Eutychelithus.	richardsoni.
	Cichlidæ (29).	147. Heros.	severus (*South America*).
	Cottidæ (30).	148. Triglopsis.	thompsoni.
		149. Uranidea.	gracilis.
		150. Potamocottus.	punctulatus.
		151. Cottopsis.	asper.
		152. Tauridea.	spilota.
Anacanthini.	Gadidæ (31).	153. Lota.	lacustris.
	Order	HEMIBRANCHII.	
———	Gasterosteidæ (32).	154. Eucalia.	inconstans.
		155. Apeltes.	quadracus.
		156. Pygosteus.	occidentalis.
		157. Gasterosteus.	aculeatus.

LIST OF SPECIES.

PETROMYZONTIDÆ.

1.—Ammocœtes Duméril. 1828. Lamperns.

(*Lampetra* Gray; *Ichthyomyzon* Girard.)

1. *Ammocœtes fluviatilis* (L.) Jor. Eastern streams and coast; also in Europe. (*d. a. s.*) (*P. nigricans* Le S.)
2. *Ammocœtes niger* (Raf.) Jor. Upper Great Lakes to Ohio Valley.
3. *Ammocœtes argenteus* (Kirt.) Jor. Great Lakes; Ohio Valley.
4. *Ammocœtes hirudo* (Grd.) Jor. Lake Erie to Arkansas.
5. *Ammocœtes castaneus* (Grd.) Jor. Upper Mississippi. (*d. s.*)
6. *Ammocœtes plumbeus* (Ayres) Jor. California.
7. *Ammocœtes borealis* (Grd.) Jor. Great Slave Lake. (*d. s.*)

2.—Entosphenus Gill. (Not yet characterized.)

8. *Entosphenus tridentatus* (Gairdner) Gill. Oregon. (*P. lividus* Grd.)
9. *Entosphenus epihexodon* Gill. California. (*d. s.*) (*P. tridentatus* Grd. non Gairdn.)
10. *Entosphenus ciliatus* (Ayres) Gill. California.
11. *Entosphenus astori* (Grd.) Gill. Oregon.

3.—Petromyzon Linnæus. 1758. Lampreys.

12. *Petromyzon marinus* L. Eastern coast, ascending streams. (*d. a. s.*) (*P. americanus* Le Sueur.)

ACIPENSERIDÆ.

4.—Acipenser Linnæus. 1758. Sturgeons.

13. *Acipenser rubicundus* Le Sueur. Great Lakes and north.
14. *Acipenser maculosus* Le Sueur. Mississippi Valley.
15. *Acipenser transmontanus* Rich. Columbia River.

5.—Scaphirhynchops Gill. 1876. Shovel-nose Sturgeon.

(*Scaphirhynchus* Heckel—preoccupied in Ornithology.)

16. *Scaphirhynchops platyrhynchus* (Raf.) Cope. Mississippi Valley and southwest to the Rio Grande.

POLYODONTIDÆ.

6.—Polyodon Lacépède. 1798. Duck-billed Cats.

17. *Polyodon folium* Lacépède. Mississippi Valley.

LEPIDOSTEIDÆ.

7.—LEPIDOSTEUS Lacépède. 1803. Gar Pikes.

§ *Lepidosteus.*

18. *Lepidosteus osseus* (L.) Ag. Great Lake Region, south and west.

§ *Cylindrosteus* Rafinesque. 1820.

19. *Lepidosteus platystomus* Raf. Great Lake Region, south and west.

8.—LITHOLEPIS Rafinesque. 1818. Alligator Gars.

(*Atractosteus* Raf. 1820.)

20. *Litholepis spatula* (Lac.) Jor. Southern States.

AMIIDÆ.

9.—AMIA Linnæus. 1758. Bow-fins.

21. *Amia calva* L. Great Lake Region, south and west.

ANGUILLIDÆ.

10.—ANGUILLA Thunberg. 179–. Eels.

22. *Anguilla vulgaris* Fleming. Entire northern hemisphere, in nearly all waters. (*d. a. s.*)

SILURIDÆ.

11.—NOTURUS Rafinesque. 1818. Stone Cats.

§ *Schilbeodes* Bleeker. 1858.

23. *Noturus sialis* Jordan. Entire Mississippi Valley, Upper Great Lakes, and in Red River of the North.
24. *Noturus gyrinus* (Mit.) Raf. Southern New York and Pennsylvania.
25. *Noturus leptacanthus* Jordan. Chattahoochee and Alabama Rivers.
26. *Noturus eleutherus* Jordan. French Broad and Tar Rivers.
27. *Noturus miurus* Jordan. Great Lakes and entire Mississippi Valley.
28. *Noturus exilis* Nelson. Wisconsin to Kansas.
29. *Noturus insignis* (Rich.) Gill & Jor. Pennsylvania to Georgia. (*N. lemniscatus* Le S.; *N. marginatus* Baird).

§ *Noturus.*

30. *Noturus flavus* Raf. Vermont to Montana; south to Kentucky.

12.—PELODICHTHYS Rafinesque. 1819. Mud Cats.

(*Hopladelus* Raf. 1820.)

31. *Pelodichthys olivaris* (Raf.) Gill & Jor. Ohio to Iowa; south to Florida.

13.—AMIURUS Rafinesque. 1820. Bullheads.

32. *Amiurus brunneus* Jor. South Carolina and Georgia.
33. *Amiurus platycephalus* (Grd.) Gill. North Carolina to Georgia.

34. ***Amiurus pullus*** (DeKay) Gill. New York and eastward.
35. ***Amiurus nigrilabris*** (Cope) Gill & Jordan. Cave streams of Eastern Pennsylvania.
36. ***Amiurus xanthocephalus*** (Raf.) Gill. Ohio Valley.
37. ***Amiurus catus*** (L.) Gill. Great Lake Region to Maine, Arkansas, and Florida.
38. ***Amiurus melas*** (Rafinesque) Jordan & Copeland. Ohio to Minnesota and Colorado.
39. ***Amiurus marmoratus*** (Holbr.) Jordan. S. Illinois to Georgia.
40. ***Amiurus vulgaris*** (Thompson) Nelson. Vermont to Dakota.
41. ***Amiurus natalis*** (Le Sueur) Gill. Great Lakes to Florida.
42. ***Amiurus erebennus*** Jordan. Florida.
43. ***Amiurus nigricans*** (Le Sueur) Gill. Great Lake Region; Mississippi Valley; south to Florida.
44. ***Amiurus borealis*** (Rich.) Gill. British America.
45. ***Amiurus lophius*** Cope. Streams about Chesapeake Bay.
46. ***Amiurus albidus*** (Le Sueur) Gill. Pennsylvania to North Carolina. (*A. lynx* (Grd.) Gill.)
47. ***Amiurus niveiventris*** Cope. North Carolina.
48. ***Amiurus lupus*** (Grd.) Gthr. Texas.
49 ***Amiurus brachyacanthus*** Cope, MSS. Texas.

14.—ICHTHÆLURUS Rafinesque. 1820. Channel Cats.

50. ***Ichthælurus punctatus*** (Raf.) Jor. Canada to Montana; south to Florida and Texas.
51. ***Ichthælurus meridionalis*** (Gthr.) Jor. Central America.
52. ***Ichthælurus robustus*** Jordan. Ohio and Mississippi Rivers.
53. ***Ichthælurus furcatus*** (Cuv. & Val.) Gill. Mississippi Valley to Texas.

CATOSTOMIDÆ.

15.—BUBALICHTHYS Agassiz. 1855. Buffalo-fishes.

54. ***Bubalichthys cyanellus*** (Nels.) Jor. Mississippi Valley and south. (*B. bubalus* Ag.)
55. ***Bubalichthys urus*** Ag. Mississippi Valley. (*B. niger* Ag.)
56. ***Bubalichthys meridionalis*** (Gthr.) Jor. Central America.

16.—ICHTHYOBUS Rafinesque. 1820. Buffalo-fishes.

57. ***Ichthyobus cyprinella*** (Val.) Ag. Louisiana. (*d. s.*)
58. ***Ichthyobus bubalus*** (Raf.) Ag. Mississippi Valley.

17.—CARPIODES Rafinesque. 1820. Carp Suckers.

59. ***Carpiodes carpio*** (Raf.) Jor. Mississippi Valley.

60. *Carpiodes bison* Ag. Mississippi Valley.
61. *Carpiodes tumidus* B. & G. Rio Grande Region. (*C. grayi* Cope.)
62. *Carpiodes thompsoni* Ag. Great Lake Region.
63. *Carpiodes cyprinus* (Le S.) Ag. New York to Missouri Region. (*C. damalis* Grd.)
64. *Carpiodes velifer* (Raf.) Ag. Ohio Valley, etc.
65. *Carpiodes cutisanserinus* Cope. Lake Erie to Tennessee.
66. *Carpiodes difformis* Cope. Ohio River.

18.—CYCLEPTUS Rafinesque. 1819. Black Horse.

67. *Cycleptus elongatus* (Le S.) Ag. Mississippi Valley.

19.—PANTOSTEUS Cope. 1876. Hard-headed Suckers.

68. *Pantosteus virescens* Cope. Arkansas River.
69. *Pantosteus platyrhynchus* Cope. Utah.
70. *Pantosteus generosus* (Grd.) Jor. New Mexico to Southern California. (*P. jarrovii* Cope.)
71. *Pantosteus plebeius* (B. & G.) Jor. Colorado Basin. (*P. delphinus* and *P. bardus* Cope.)

20.—CATOSTOMUS Le Sueur. 1817. Fine-scaled Suckers.

§ *Catostomus.*

72. *Catostomus discobolus* Cope. Colorado Basin; Snake River, Idaho.
73. *Catostomus tahoensis* Gill & Jordan. Lake Tahoe, Nevada.
74. *Catostomus longirostris* Le Sueur. Vermont to Puget's Sound; north to Alaska. (*C. hudsonius* Le S., *C. griseus* Grd., *C. lactarius* Grd., *C. fosterianus* Rich., *C. aurora* Ag., etc.)
75. *Catostomus latipinnis* (Grd.) Cope. Platte Basin; Colorado Basin. (*C. guzmaniensis* Grd.)

§ *Decadactylus* Raf.

76. *Catostomus occidentalis* Ayres. Colorado to California. (*C. bernardini* Grd.)
77. *Catostomus labiatus* Ayres. Northern California.
78. *Catostomus macrochilus* Grd. Columbia River.
79. *Catostomus commersoni* (Lacépède) Jordan. Maine to the Great Plains and south. (*C. teres*, *communis*, *bostoniensis*, *sucklii*, *alticolus*, *trisignatus*, *chloropterus*, etc., of authors.)
80. *Catostomus clarkii* B. & G. Gila Basin.
81. *Catostomus insignis* B. & G. New Mexico; Arizona.

§ *Hypentelium* Rafinesque. 1818.

82. *Catostomus nigricans* Le S. New York to Minnesota and south.

21.—*CHASMISTES Jordan, *gen. nov.* 1878. Big-mouthed Suckers.

83. *Chasmistes fecundus* (Cope & Yarrow) Jordan. Utah Basin.

22.—ERIMYZON Jordan. 1876. Chub Suckers.

84. *Erimyzon sucetta* (Lac.) Jordan. New England to Minnesota, Florida, and Texas. (*E. oblongus*, *gibbosus*, *tenuis*, *claviformis*, etc.)

23.—MINYTREMA Jordan. 1878. Striped Suckers.

85. *Minytrema melanops* (Raf.) Jordan. Great Lake Region to Florida and Texas.

24.—MYXOSTOMA Rafinesque. 1820. Red Horse.

(*Teretulus* Raf., 1820; *Ptychostomus* Agassiz, 1855.)

86. *Myxostoma papillosum* (Cope) Jor. North Carolina to Georgia.
87. *Myxostoma coregonus* (Cope) Jor. North Carolina.
88. *Myxostoma pidiense* (Cope) Jor. Great Pedee River.
89. *Myxostoma congestum* (Grd) Jor. Missouri to Texas. (*P. bucco* Cope.)
90. *Myxostoma velatum* (Raf.) Jor. Pennsylvania to Georgia and Minnesota. (*P. collapsus* Cope.)
91. *Myxostoma album* (Cope) Jor. North Carolina.
92. *Myxostoma thalassinum* (Cope) Jor. North Carolina.
93. *Myxostoma carpio* (Val.) Jor. Ohio Valley and Upper Great Lakes.
94. *Myxostoma macrolepidotum* (Le S.) Jor. Great Lake Region and Pennsylvania to Arizona and south. (*C. duquesnii* Le S.; *C. erythrurus* Raf.)
95. *Myxostoma aureolum* (Le S.) Jor. Great Lake Region; Upper Mississippi and north.
96. *Myxostoma anisurum* (Raf.) Jor. Ohio Valley. (*P. breviceps* Cope.)
97. *Myxostoma crassilabre* (Cope) Jor. North Carolina
98. *Myxostoma conus* (Cope) Jor. North Carolina.
99. *Myxostoma euryops* Jordan. Alabama River.
100. *Myxostoma pœcilurum* Jordan. Louisiana.
101. *Myxostoma albidum* (Grd.) Jor. Texas.
102. *Myxostoma cervinum* (Cope) Jor. Virginia to Georgia.

25.—PLACOPHARYNX Cope. 1870. Big-jawed Suckers.

103. *Placopharynx carinatus* Cope. Great Lake Region and Upper Mississippi Valley.

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* This genus is distinguished from *Catostomus* by the very large, terminal mouth, the lower jaw being very strong, oblique, its length about one-third that of the head. The lips in *Chasmistes* are little developed, and are very nearly smooth. The type of the genus is *C. fecundus* Cope & Yarrow. It will be elsewhere fully characterized.

26.—*QUASSILABIA Jordan & Brayton. 1878. Hare-lip Suckers.

(*Lagochila* J. & B., 1877, preoccupied.)

104. *Quassilabia lacera* Jordan & Brayton. Tennessee River.

CYPRINIDÆ.

27.—EXOGLOSSUM Rafinesque. 1818. Cut-lips.

105. *Exoglossum maxillilingua* (Raf.) Haldeman. New York to Ohio and Maryland.

28.—CAMPOSTOMA Agassiz. 1855. Stone Rollers.

106. *Campostoma anomalum* (Raf.) Ag. Ohio to Dakota and South.
107. *Campostoma formosulum* Grd. Texas. (*d. s.*)
108. *Campostoma nasutum* Grd. New Leon. (*d. s.*)
109. *Campostoma ornatum* Grd. Chihuahua River. (*d. s.*)

29.—ACROCHILUS Agassiz. 1855. Hard-mouth Chubs.

110. *Acrochilus alutaceus* Ag. & Pick. Columbia Basin.

30.—ORTHODON Girard. 1856.

111. *Orthodon microlepidotus* (Ayres) Girard. California; Utah.

31.—HYBOGNATHUS Agassiz. 1855. Blunt-jawed Dace.

§ *Hybognathus.*

112. *Hybognathus placitus* Grd. Arkansas River.
113. *Hybognathus nuchalis* Agassiz. Ohio Valley to New Mexico.
114. *Hybognathus argyritis* Girard. New Jersey to Dakota, New Mexico, and south.
115. *Hybognathus regius* Girard. Chesapeake Basin.
116. *Hybognathus evansi* Grd. Nebraska. (*d. s.*)
117. *Hybognathus siderius* Cope. Arizona.
118. *Hybognathus flavipinnis* Cope, MSS. Texas.
119. *Hybognathus nigrotæniatus* Cope, MSS. Texas.

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* When the name *Lagochila* was first proposed for this genus, its authors were not aware that the masculine form, *Lagochilus*, had been already given to two different genera, to one of Gasteropods by Blanford, and to one of Insects by Loew. The words *Lagochila* and *Lagochilus* are identical in etymology and in all except terminations, and many writers would consider them insufficiently distinct, and would hold that the name *Lagochila* should be changed. At present, I am inclined to the contrary opinion; nevertheless, as the matter stands, and as the name *Lagochila* has not yet come into general use, less confusion perhaps will result from renaming the genus, than from any other course. The name *Quassilabia* (Jordan & Brayton) is accordingly suggested as a substitute for *Lagochila*, considered to be preoccupied in conchology. The etymology is *quassus*, broken or torn; *labia*, lip. The case is precisely like that of the genus of Doves, *Leptoptila* Swainson, lately named *Æchmoptila* by Dr. Coues, on account of the previous *Leptoptilus* of Lesson.

§ *Algoma* Grd. 1856.

120. *Hybognathus amarus* (Grd.) Jor. Rio Grande.
121. *Hybognathus fluviatilis* (Grd.) Jor. New Leon.

§ *Dionda* Girard. 1856.

122. *Hybognathus episcopus* Grd. Texas.
123. *Hybognathus serenus* Grd. Texas.
124. *Hybognathus melanops* Grd. Rio Grande Region.
125. *Hybognathus plumbeus* Grd. Canadian River.
126. *Hybognathus spadiceus* Grd. Arkansas.
127. *Hybognathus griseus* Grd. Indian Territory. (*d. s.*)

32.—COLISCUS Cope. 1872.

128. *Coliscus parietalis* Cope. Missouri River, Mo.

33.—PIMEPHALES Rafinesque. 1820. Fat-heads.

129. *Pimephales promelas* Raf. Pennsylvania to Montana and Texas.

34.—HYBORHYNCHUS Agassiz. 1855. Blunt-nosed Minnows.

130.—*Hyborhynchus notatus* (Raf.) Ag. New York to Kentucky and northwest.
131. *Hyborhynchus superciliosus* Cope. Ohio Valley and north. (*d. s.*)
132. *Hyborhynchus nigellus* Cope. Arkansas River, Colorado.
133. *Hyborhynchus perspicuus* Girard. Arkansas River. (*d. s.*)
134. *Hyborhynchus confertus* Girard. Texas. (*d. s.*)
135. *Hyborhynchus tenellus* Girard. Indian Territory. (*d. s.*)
136. *Hyborhynchus puniceus* Girard. Canadian River. (*d. s.*)

35.—COCHLOGNATHUS Baird & Girard. 1854.

137. *Cochlognathus ornatus* B. & G. Rio Grande.
138. *Cochlognathus biguttatus* Cope, MSS. Texas.

36.—ALGANSEA Girard. 1856.

139. *Algansea tincella* (Val.) Grd. Mexico.
140. *Algansea antica* Cope. Texas. (*d. s.*)

37.—ALBURNOPS Girard. 1856. Minnows.

(*Hybopsis* Cope; probably not of Agassiz).

§ *Hudsonius* Girard. 1856.

141. *Alburnops hudsonius* (Clinton) Jor. Middle States.
142. *Alburnops amarus* (Grd.) Jor. Maryland to Georgia.
143. *Alburnops saludanus* Jor. & Brayton. Santee Basin.
144. *Alburnops storerianus* (Kirt.) Jor. Great Lake Region.

§ *Alburnops* Grd.

145. *Alburnops blennius* Grd. Arkansas River.
146. *Alburnops shumardi* Grd. Arkansas River. (*d. s.*)

147. *Alburnops illecebrosus* Grd. Arkansas River. (*d. s.*)
148. *Alburnops microstomus* (Raf.) Jor. Kentucky to North Carolina.
149. *Alburnops stramineus* (Cope) Jor. Great Lakes and Ohio Valley.
150. *Alburnops tuditanus* (Cope) Jor. Indiana, etc. (*d. s.*)
151. *Alburnops volucellus* (Cope) Jor. Michigan to Minnesota.
152. *Alburnops spectrunculus* (Cope) Jor. Tennessee River.
153. *Alburnops procne* (Cope) Jor. Eastern Pennsylvania.
154. *Alburnops scylla* (Cope) Jor. Platte River; Arkansas River.
155. *Alburnops missuriensis* (Cope) Jor. Missouri to Texas.
156. *Alburnops fretensis* (Cope) Jor. Michigan to Illinois.
157. *Alburnops hæmaturus* (Cope) Jor. Great Lake Region to Illinois.

§ *Hydrophlox* Jordan. 1878.

158. *Alburnops bivittatus* (Cope) Jor. Utah.
159. *Alburnops timpanogensis* (Cope) Jor. Utah.
160. *Alburnops plumbeolus* Cope. Great Lakes.
161. *Alburnops lacertosus* (Cope) Jor. Tennessee River.
162. *Alburnops xænocephalus* Jor. Alabama River.
163. *Alburnops chrosomus* Jor. Alabama River.
164. *Alburnops chalybæus* (Cope) Jor. Pennsylvania; New Jersey.
165. *Alburnops chiliticus* (Cope) Jor. Yadkin River.
166. *Alburnops chlorocephalus* (Cope) Jor. Santee Basin.
167. *Alburnops rubricroceus* (Cope) Jor. Upper Tennessee and Savannah Rivers.
168. *Alburnops lutipinnis* Jordan & Brayton. Oconee River.
169. *Alburnops roseus* Jordan. Louisiana.

38.—LUXILUS Rafinesque. 1820. Shiners.

(*Hypsilepis* Baird.)

§ *Luxilus*.

170. *Luxilus cornutus* (Mitch.) Jor. New England to Wyoming and south.
171. *Luxilus selene* Jor. Lake Superior.

§ ———.

172. *Luxilus coccogenis* (Cope) Jor. Tennessee and Savannah Rivers.

§ *Photogenis* Cope. 1866.

173. *Luxilus galacturus* (Cope) Jor. Tennessee, Cumberland, and Savannah Rivers.
174. *Luxilus analostanus* (Cope) Jor. New York to Iowa and Tennesssee.
175. *Luxilus leucopus* Jordan & Brayton. Chattahoochee River.
176. *Luxilus niveus* (Cope) Jor. Santee Basin.
177. *Luxilus calliurus* Jor. Alabama to Louisiana. (*d. g.*)

§ ——.

178. *Luxilus iris* (Cope) Jor. Rio Grande, New Mexico.
179. *Luxilus jugalis* (Cope) Jor. Missouri River; Arkansas River.

39.—LYTHRURUS Jordan. 1876. Redfins.

180. *Lythrurus cyanocephalus* Copeland. Michigan to Minnesota.
181. *Lythrurus atripes* Jordan. Southern Illinois and south.
182. *Lythrurus diplæmius* (Raf.) Jor. Ohio Valley.
183. *Lythrurus ardens* (Cope) Jor. Kentucky to North Carolina.

40.—CYPRINELLA Girard. 1856.

§ *Cyprinella.*

184. *Cyprinella bubalina* Grd. Arkansas to Texas.
185. *Cyprinella venusta* Grd. Texas. (*d. s.*)
186. *Cyprinella macrostoma* Grd. Rio Grande Region.
187. *Cyprinella beckwithi* Grd. Arkansas. (*d. s.*)
188. *Cyprinella texana* Grd. Texas. (*d. s.*)
189. *Cyprinella luxiloides* Grd. Texas. (*d. s.*)
190. *Cyprinella gunnisoni* Grd. Utah. (*d. s.*)
191. *Cyprinella suavis* Grd. Texas. (*d. s.*)
192. *Cyprinella ludibunda* Grd. Utah. (*d. s.*)
193. *Cyprinella lepida* Grd. Texas. (*d. s.*)
194. *Cyprinella lugubris* Grd. Utah. (*d. s.*)
195. *Cyprinella notata* Grd. Texas. (*d. s.*)
196. *Cyprinella whipplii* Grd. Arkansas. (*d. a. g.*)
197. *Cyprinella billingsiana* Cope. Missouri. (*d. a. g.*) (*d. s.*)
198. *Cyprinella cercostigma* Cope. Pearl River, Mississippi. (*d. a. g.*)

§ *Moniana* Girard. 1856.

199. *Cyprinella lutrensis* (Grd.) Jor. Arkansas.
200. *Cyprinella leonina* (Grd.) Jor. Texas. (*d. s.*)
201. *Cyprinella lætabilis* (Grd.) Jor. Rio Grande. (*d. s.*)
202. *Cyprinella deliciosa* (Grd.) Jor. Texas. (*d. s.*)
203. *Cyprinella complanata* (Grd.) Jor. Rio Grande. (*d. s.*)
204. *Cyprinella forbesi* Jordan. Southern Illinois.
205. *Cyprinella frigida* (Grd.) Jor. Texas. (*d. s.*)
206. *Cyprinella pulchella* (Grd.) Jor. Arkansas River. (*d. s.*)
207. *Cyprinella proserpina* (Grd.) Jor. Texas. (*d. s.*)
208. *Cyprinella aurata* (Grd.) Jor. New Mexico. (*d. s.*)
209. *Cyprinella gracilis* (Grd.) Jor. New Leon. (*d. s.*)
210. *Cyprinella formosa* (Grd.) Jor. Rio Mimbres. (*d. s.*)
211. *Cyprinella nitida* (Grd.) Jor. New Leon. (*d. s.*)
212. *Cyprinella rutila* (Grd.) Jor. New Leon. (*d. s.*)
213. *Cyprinella couchii* (Grd.) Jor. New Leon. (*d. s.*)

41.—CODOMA Girard. 1856. Silver-fins.

§ *Erogala* Jordan. 1878.

214. *Codoma callisema* Jordan. Ocmulgee River.
215. *Codoma cærulea* Jordan. Alabama River.
216. *Codoma chloristia* Jordan & Brayton. Santee River.
217. *Codoma trichroistia* Jordan & Gilbert. Alabama River.
218. *Codoma callistia* Jordan. Alabama River.
219. *Codoma stigmatura* Jordan. Alabama River.
220. *Codoma eurystoma* Jordan. Chattahoochee River.

§ ———.

221. *Codoma xænura* Jordan. Ocmulgee River.
222. *Codoma pyrrhomelas* (Cope) Jor. Santee Basin.
223. *Codoma grandipinnis* Jordan. Flint River.

§ *Codoma.*

224. *Codoma ornata* Grd. Chihuahua River.
225. *Codoma vittata* Grd. Mexico.

42.—NOTROPIS Rafinesque. 1817. Rosy-faced Shiners.

(*Alburnellus* Grd., 1856; *Minnilus* Raf., 1820.)

§ *Notropis.*

226. *Notropis jemezanus* (Cope) Jor. Rio Grande, New Mexico.
227. *Notropis atherinoides* Raf. Lake Region and Ohio Valley. (***N. rubellus***, ***dinemus***, ***dilectus***, etc., of authors.)
228. *Notropis lepidulus* (Grd.) Jor. Black Warrior River. (*d. s.*)
229. *Notropis megalops* (Grd.) Jor. Texas. (*d. s.*)
230. *Notropis amabilis* (Grd.) Jor. Texas. (*d. s.*)
231. *Notropis socius* (Grd.) Jor. Texas. (*d. s.*)
232. *Notropis stilbius* (Jor.) Alabama River. (*d. s.*)
233. *Notropis formosus* (Putnam) Jor. Mobile. (*d. s.*)
234. *Notropis altipinnis* (Cope) Jor. Yadkin River.
235. *Notropis micropteryx* (Cope) Jor. Tennessee and Cumberland Rivers.
236. *Notropis rubrifrons* (Cope) Jor. Ohio Valley.
237. *Notropis umbratilis* (Grd.) Jor. Arkansas. (*d. s.*)
238. *Notropis oligaspis* (Cope) Jor. Kansas. (*d. s.*)
239. *Notropis simus* (Cope) Jor. New Mexico.
240. *Notropis amœnus* (Abbott) Jor. New Jersey. (*d. s.*)
241. *Notropis telescopus* (Cope) Jor. Tennessee River. (*d. s.*)
242. *Notropis photogenis* (Cope) Jor. Ohio to South Carolina.
243. *Notropis percobromus* (Cope) Jor. Missouri.
244. *Notropis matutinus* (Cope) Jor. Neuse River.

§ ———.

245. *Notropis lirus* Jordan. Tennessee and Alabama Rivers.

43.—CLIOLA Girard. 1856.

§ *Episema* Cope and Jordan. 1877.

246. *Cliola ariomma* (Cope) Jor. Indiana.
247. *Cliola scabriceps* (Cope) Jor. Ohio Valley.
248. *Cliola leucioda* (Cope) Jor. Tennessee River.
249. *Cliola piptolepis* (Cope) Jor. Platte River.

§ *Cliola.*

250. *Cliola vigilax* (B. & G.) Grd. Red River.
251. *Cliola velox* Grd. San Antonio River.
252. *Cliola vivax* Grd. Texas. (*d. s.*)

44.—ERICYMBA Cope. 1864.

253. *Ericymba buccata* Cope. Pennsylvania to Illinois.

45.—PROTOPORUS Cope. 1872.

254. *Protoporus domninus* Cope. Idaho.

46.—HEMITREMIA Cope. 1870.

§ *Hemitremia.*

255. *Hemitremia vittata* Cope. Kentucky; Tennessee; Virginia.

§ ———.

256. *Hemitremia heterodon* Cope. Michigan to Illinois. (*d. g.*)
257. *Hemitremia bifrenata* Cope. Massachusetts to Maryland. (*d. g.*)

47.—CHROSOMUS Rafinesque. 1820. Red-bellied Minnows.

258. *Chrosomus erythrogaster* Raf. Wisconsin to Pennsylvania and Missouri.
259. *Chrosomus oreas* Cope. North Carolina. (*d. s.*)

48.—PHOXINUS Rafinesque. 1820. Minnows.

260. *Phoxinus neogæus* Cope. Michigan; Wisconsin.
261. *Phoxinus flammeus* Jordan & Gilbert. Tennessee River.
262. *Phoxinus margaritus* (Cope) Jor. Pennsylvania; Maryland. (*d. g.*)

49.—GILA Baird & Girard. 1853. Leather-sided Minnows.

§ *Clinostomus* Girard. 1856.

263. *Gila elongata* (Kirt.) Jor. Ohio Valley and Lake Region.
264. *Gila proriger* Cope. Ohio Valley. (*d. s.*)
265. *Gila estor* Jordan & Brayton. Tennessee and Cumberland Rivers.
266. *Gila funduloides* (Grd.) Cope. Chesapeake Basin.

267. *Gila vandoisula* (Val.) Jor. Virginia to Georgia. (*C. affinis* Girard.)
268. *Gila phlegethontis* Cope. Beaver River, Utah.
269. *Gila montana* Cope. Idaho to Arizona.
270. *Gila hydrophlox* Cope. Idaho.
271. *Gila tænia* Cope. Utah.
272. *Gila ardesiaca* Cope. Rocky Mountain Region

§ *Tigoma* Girard. 1856.

273. *Gila gula* Cope. New Mexico.
274. *Gila pandora* Cope. New Mexico; Colorado.
275. *Gila humboldti* (Grd.) Cope. Nevada.
276. *Gila egregia* (Grd.) Cope. Colorado; Utah; New Mexico.
277. *Gila nigra* Cope. Arizona.
278. *Gila pulchella* B. & G. Mexico.
279. *Gila conformis* (B. & G.) Jor. San Joaquin Valley.
280. *Gila bicolor* (Grd.) Jor. Klamath Lake, Oregon. (*d. s.*)
281. *Gila purpurea* (Grd.) Jor. San Bernardino, Mexico. (*d. s.*)
282. *Gila intermedia* (Grd.) Jor. Gila Basin. (*d. s.*)
283. *Gila obesa* (Grd.) Jor. Salt Lake Valley. (*d. s.*)
284. *Gila lineata* (Grd.) Jor. Utah. (*d. s.*)
285. *Gila utensis* Jor. Utah. (*Tigoma gracilis* Grd.) (*d. s.*)
286. *Gila nacrea* Cope. Colorado Basin, Wyoming.
287. *Gila seminuda* Cope & Yarrow. Rio Virgen, Utah.
288. *Gila boucardi* (Gthr.) Jor. Mexico. (*d. s.*)

§ *Gila*.

289. *Gila robusta* B. & G. Arizona; New Mexico.
290. *Gila grahami* B. & G. Arizona; New Mexico.
291. *Gila gracilis* B. & G. Arizona.
292. *Gila elegans* B. & G. Arizona; New Mexico.
293. *Gila emorii* Grd. Gila River.
294. *Gila affinis* Abbott. Platte River. (*d. s.*)

§ *Ptychochilus* Agassiz. 1855.

295. *Gila oregonensis* (Rich.) Jor. Oregon and north.
296. *Gila grandis* Ayres. California.
297. *Gila lucius* (Grd.) Jor. Rio Colorado.
298. *Gila rapax* (Grd.) Jor. California.
299. *Gila vorax* (Grd.) Jor. Utah. (*d. s.*)

50.—SIBOMA Girard. 1856.

300. *Siboma crassicauda* Grd. California.
301. *Siboma atraria* Grd. Idaho to New Mexico.

51.—MYLOLEUCUS Cope. 1872.

§ *Myloleucus.*

302. *Myloleucus pulverulentus* Cope. Utah to Montana.
303. *Myloleucus parovanus* Cope. Utah. (*d. s.*)
304. *Myloleucus squamatus* (Gill) Jor. Salt Lake Basin.

§ ——.

305. *Myloleucus bicolor* (Grd.) Jor. Klamath Lake.
306. *Myloleucus obesus* (Grd.) Jor. Nevada.
307. *Myloleucus formosus* (Grd.) Jor. Merced and Mohave Rivers.

52.—CHEONDA Girard. 1856.

308. *Cheonda cooperi* Grd. Columbia River.
309. *Cheonda cærulea* Grd. Lost River, Oregon.
310. *Cheonda crassa* (Grd.) Jor. Sacramento River. (*d. s.*)
311. *Cheonda pulchra* (Grd.) Jor. Chihuahua. (*d. s.*)
312. *Cheonda nigrescens* (Grd.) Jor. Rio Grande. (*d. s.*)
313. *Cheonda gibbosa* (B. & G.) Jor. Gila Basin. (*d. s.*)

53.—LAVINIA Girard. 1854.

314. *Lavinia exilicauda* B. & G. California.
315. *Lavinia harengus* Grd. California. (*d. s.*)
316. *Lavinia gibbosa* Ayres. California. (*d. s.*)

54.—NOTEMIGONUS Rafinesque. 1819.

317. *Notemigonus chrysoleucus* (Mit) Jor. Maine to Minnesota and Texas.
318. *Notemigonus occidentalis* (B. & G.) Jor. California.
319. *Notemigonus americanus* (L.) Jor. South Carolina; Georgia.
320. *Notemigonus leptosomus* (Grd.) Jor. Texas.
321. *Notemigonus lucidus* (Grd.) Jor. Indian Territory. (*d. s.*)

55.—RICHARDSONIUS Girard. 1856.

322. *Richardsonius balteatus* (Rich.) Grd. Columbia River.
323. *Richardsonius lateralis* Grd. Washington Territory.

56.—PHENACOBIUS Cope. 1867.

(*Sarcidium* Cope, 1872.)

324. *Phenacobius teretulus* Cope. Ohio Valley.
325. *Phenacobius uranops* Cope. Tennessee River.
326. *Phenacobius scopiferus* (Cope) Jor. Illinois to Missouri.
327. *Phenacobius catostomus* Jordan. Alabama River.
328. *Phenacobius mirabilis* (Grd.) Jor. Arkansas River.

57.—RHINICHTHYS Agassiz. 1850. Black-nosed Dace.

329. *Rhinichthys atronasus* (Mitch.) Ag. New England to Ohio and Virginia.
330. *Rhinichthys obtusus* Ag. Michigan to Alabama. (*d. s.*)
331. *Rhinichthys dulcis* (Grd.) Jor. Nebraska to Utah. (*d. s.*)
332. *Rhinichthys meleagris* Ag. Illinois; Iowa.
333. *Rhinichthys maxillosus* Cope. Slopes of Rocky Mountains.
334. *Rhinichthys cataractæ* (Val.) Jor. New England to Virginia and Wisconsin. (*R. nasutus* (Ayres) Ag.)

58.—APOCOPE Cope. 1872.

§ *Apocope.*

335. *Apocope carringtoni* Cope. Utah.

§ *Eritrema* Cope. 1876.

336. *Apocope henshawi* Cope. Utah; Idaho. (*d. s.*)
337. *Apocope vulnerata* Cope. Utah.
338. *Apocope oscula* (Grd.) Cope. Colorado; Utah; Arizona; New Mexico.
339. *Apocope couesi* Yarrow. Mountain streams, Arizona. (*d. s.*)
340. *Apocope ventricosa* Cope. Arizona; New Mexico. (*d. s.*)
341. *Apocope notabilis* (Grd.) Jor. Sonora. (*d. s.*)
342. *Apocope nubilus* (Grd.) Jor. Washington Territory.

59.—CERATICHTHYS Baird. 1853. Horny Heads.

(*? Hybopsis*, Agassiz. *Nocomis* et *Hybopsis*, Grd.)

§ *Ceratichthys.*

343. *Ceratichthys biguttatus* (Kirt.) Girard. Pennsylvania to Utah and south.
344. *Ceratichthys micropogon* Cope. Eastern Pennsylvania. (*d. s.*)
345. *Ceratichthys nebrascensis* (Grd.) Jor. Sweetwater River. (*d. s.*)

§ *? Hybopsis* Ag. 1854.

346. *Ceratichthys amblops* (Raf.) Grd. Ohio Valley.
347. *Ceratichthys gracilis* (Ag.) Jor. Tennessee to Georgia. (*C. winchelli* (Grd.) Jor. *C. hyalinus* Cope.) (*d. s.*)
348. *Ceratichthys rubrifrons* Jordan. South Carolina; Georgia.
349. *Ceratichthys hypsinotus* Cope. North Carolina.
350. *Ceratichthys dissimilis* (Kirt.) Cope. Ohio Valley.
351. *Ceratichthys sterletus* Cope. New Mexico.

§ ——.

352. *Ceratichthys physignathus* Cope. Arkansas River, Colorado.
353. *Ceratichthys squamilentus* Cope. Colorado Basin.
354. *Ceratichthys prosthemius* Cope. Great Lakes.
355. *Ceratichthys milneri* Jordan. Lake Superior.

§ ——.

356. *Ceratichthys monachus* Cope. Tennessee River.
357. *Ceratichthys labrosus* Cope. Santee Basin.
358. *Ceratichthys zanemus* Jordan & Brayton. Santee River. (*d. s.*)
359. *Ceratichthys gelidus* (Grd.) Jor. Milk River. (*d. s.*)
360. *Ceratichthys vernalis* (Grd.) Jor. Arkansas River. (*d. s.*)
361. *Ceratichthys æstivalis* (Grd.) Jor. New Leon. (*d. s.*)

60.—SEMOTILUS Rafinesque. 1820. Horned Dace.

§ *Leucosomus* Heckel. 1842.

362. *Semotilus bullaris* (Raf.) Jor. New England to Virginia. (*S. rhotheus* Cope. *L. cataractus* Baird. *L. argenteus* Storer.)
363. *Semotilus dissimilis* (Grd.) Jor. Milk River. (*d. s.*)

§ *Semotilus.*

364. *Semotilus corporalis* (Mitch.) Putnam. Massachusetts to the Rocky Mountains and south.
365. *Semotilus thoreauianus* Jordan. Flint River, Georgia.

61.—AGOSIA Girard. 1856.

366. *Agosia chrysogaster* Grd. Sonora.
367. *Agosia metallica* Grd. Rio Gila.

62.—POGONICHTHYS Girard. 1854.

368. *Pogonichthys inæquilobus* B. & G. California.
369. *Pogonichthys symmetricus* B. & G. California.
370. *Pogonichthys argyriosus* B. & G. California. (*d. s.*)

63.—PLATYGOBIO Gill. 1861.

371. *Platygobio gracilis* (Rich.) Gill & Jor. Colorado River to the Saskatchawan. (*P. communis* (B. & G.) Gill.)

64.—MYLOCHILUS Agassiz. 1855.

372. *Mylochilus caurinus* (Rich.) Grd. Oregon and north.

65.—MYLOPHARODON Ayres. 1855.

373. *Mylopharodon conocephalus* (Ayres) Grd. California.

66.—*TIAROGA Girard. 1856.

374. *Tiaroga cobitis* Grd. Rio Gila.

67.—GRAODUS Günther. 1868.

375. *Graodus nigrotæniatus* Gthr. Mexico.

68.—LEPIDOMEDA Cope. 1874.

376. *Lepidomeda vittata* Cope. Colorado River, Arizona.
377. *Lepidomeda jarrovii* Cope. Colorado River, Arizona.

69.—MEDA Girard. 1856.

378. *Meda fulgida* Girard. Rio Gila.

70.—PLAGOPTERUS Cope. 1874.

379. *Plagopterus argentissimus* Cope. San Luis Valley, Western Colorado.

DORYSOMATIDÆ.

71.—DORYSOMA Rafinesque. 1820. Gizzard Shads.

380. *Dorysoma cepedianum heterurum* (Raf.) Jor. Mississippi Valley—escaped into the lakes.

CLUPEIDÆ.

72.—ALOSA Cuvier. 1829. Shads.

381. *Alosa sapidissima* (Wilson) Storer. Coast—ascending most streams.

73.—POMOLOBUS Rafinesque. 1819. Alewives.

§ *Meletta* Valenciennes, 1847.

382. *Pomolobus pseudoharengus lacustris* Jordan. Lake Ontario and lakes of Western New York.

§ *Pomolobus.*

383. *Pomolobus chrysochloris* Raf. Mississippi Valley—escaped into the lakes.

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* I have at present little faith in the validity of the genus *Tiaroga*. It looks like a *Cliola* in which one of the teeth in the main row has been lost.

HYODONTIDÆ.

74.—HYODON Le Sueur. 1818. Moon Eyes.

§ *Elattonistius* Gill & Jordan. 1878.

384. *Hyodon chrysopsis* Rich. Missouri and Saskatchawan Basins.

§ *Hyodon.*

385. *Hyodon tergisus* Le Sueur. Great Lakes and Upper Mississippi Valley.
386. *Hyodon selenops* Jordan & Bean. Tennessee and Alabama Rivers.

MICROSTOMATIDÆ.

75.—OSMERUS Linnæus. 1758. Smelts.

387. *Osmerus mordax* (Mitch.) Gill. Eastern coast—ascending streams northward.

76.—MALLOTUS Cuvier. 1829. Capelins.

388. *Mallotus villosus* (Müller) Cuv. Nova Scotia northward—coastwise.

SALMONIDÆ.

77.—COREGONUS Linnæus. 1758. Whitefish.

§ *Prosopium* Milner. 1878.

389. *Coregonus couesi* Milner. Montana (headwaters Saskatchawan).
390. *Coregonus williamsoni.* Grd. Region west of Rocky Mountains.
391. *Coregonus quadrilateralis* Rich. New Hampshire and Great Lake Region to Alaska. (*C. novangliæ* Prescott.)

§ *Coregonus.*

392. *Coregonus clupeiformis* (Mitch.) Milner. Great Lake Region to Polar Sea. (*C. albus* Le S.)
393. *Coregonus kennicotti* Milner, MSS. Yukon River, Alaska.

§ ———.

394. *Coregonus labradoricus* Rich. Northern New York to Labrador (*C. neohantoniensis* Prescott).

§ *Argyrosomus* Agassiz. 1850.

395. *Coregonus hoyi* (Gill) Jordan. Upper Great Lakes.
396. *Coregonus artedi* (Le S.) Hoy. Great Lake Region and Upper Mississippi Valley to Alaska.
397. *Coregonus nigripinnis* (Gill) Jordan. Lake Michigan.

§ *Allosomus* Jordan. 1878.

398. *Coregonus tullibee* Rich. Upper Great Lakes.

78.—STENODUS Richardson. 1860. Inconnus.

(*Luciotrutta* Günther, 1866.)

399. *Stenodus mackenzii* Rich. Mackenzie's River.

79.—THYMALLUS Cuvier. 1829. Graylings.

400. *Thymallus signifer* (Rich.) Cuv. & Val. British America.
401. *Thymallus montanus* Milner. Montana. (*d. s.*)
402. *Thymallus tricolor* Cope. Michigan and northwest. (*d. s.*)

80.—SALVELINUS Richardson. 1836. Charrs.

(*Baione* DeKay, 1842. *Umbla* Rapp. *Salmo* Siebold.)

403. *Salvelinus oquassa* (Grd.) Gill & Jordan. Rangeley Lake, etc., in Maine.
404. *Salvelinus lordii* (Gthr.) G. & J. British Columbia. (*d. s.*)
405. *Salvelinus tudes* (Cope) G. & J. Alaska. (*d. s.*)
406. *Salvelinus spectabilis* (Grd.) G. & J. Streams west of Sierra Nevada. (*S. campbelli* Suckley; *S. parkii* Suckley.)
407. *Salvelinus bairdii* (Suckl.) G. & J. Streams west of Sierra Nevada.
408. *Salvelinus fontinalis* (Mitch.) G. & J. Georgia to Lake Superior and Hudson's Bay. (*S. hudsonicus* Suckley; *S. canadensis* Smith; *S. immaculatus* Storer.)
409. *Salvelinus hoodii* (Rich.) G. & J. Northeastern British America.
410. *Salvelinus rossii* (Rich.) G. & J. Arctic America. (*d. s.*)
411. *Salvelinus stagnalis* (Fabricius) G. & J. Boothia Felix. Greenland. (*S. alipes* Rich. *S. nitidus* Rich.)
412. *Salvelinus arcturus* (Gthr.) G. & J. Arctic America.

81.—CRISTIVOMER Gill & Jordan. 1878. Great Lake Trout.

413. *Cristivomer namaycush* (Walb.) G. & J. Lakes, Maine to the Rocky Mountains and northward. (*S. toma* Hamlin. *S. symmetrica* Prescott. *S. adarondacus* Norris. *S. pallidus* Raf. *S. confinis* DeK.)
414. *Cristivomer siscowet* (Ag.) G. & J. Lake Superior.

82.—SALAR Valenciennes. 1849. Salmon Trout.

(*Fario* Valenciennes, 1849, in part; *Trutta* Siebold.)

415. *Salar clarkii* (Rich.) G. & J. Headwaters of Rio Grande, Platte, Missouri, and Columbia; northwestward to the Pacific. Var. *aurora*, east of the Cascade Range. (*S. aurora* Grd. *S. lewisi* Grd. *S. virginalis* Grd. *S. stellatus* Grd. *S. carinatus* Cope.)

416. ***Salar henshawi*** Gill & Jordan. Lake Tahoe; Sacramento River.
417. ***Salar stomias*** (Cope) G. & J. Kansas River.
418. ***Salar spilurus*** (Cope) G. & J. Colorado, Idaho, Utah, and Rio Grande Region. (*S. pleuriticus* Cope, a variety.)
419. ***Salar tsuppitch*** (Rich) G. & J. California to Washington.
420. ***Salar irideus*** (Gibbons) Grd. Streams west of Sierra Nevada. (*S. masoni* Suckley. *S. newberrii* Grd.)

83.—SALMO Linnæus. 1758. Salmons.

421. ***Salmo salar*** L. Northern Atlantic coasts of Europe and America—ascending streams; often land-locked. (*S. omiscomaycus* Walb. *S. sebago* Grd. *S. gloveri* Grd.)

84.—ONCORHYNCHUS Suckley. 1861. Hooked-jaw Salmons.

§ *Oncorhynchus.*

422. ***Oncorhynchus gorbuscha*** (Walb.) G. & J. North Pacific coasts of Asia and America. (*S. proteus* Pallas. *S. gibber* Bloch, and of Suckley.)
423. ***Oncorhynchus keta*** (Walb.) G. & J. North Pacific coasts of Asia and America. (*S. lagocephalus* Pallas. *S. scouleri* Rich. *S. confluentus* Suckley.)
424. ***Oncorhynchus nerka*** (Walb.) G. & J. North Pacific coasts of Asia and America. (*S. lycaodon* and *japonensis* Pallas. *S. canis*, *cooperi*, *scouleri*, *truncatus*, and *richardi* Suckley. *S. paucidens*, *dermatinus*, and *consuetus* Rich.)
425. ***Oncorhynchus quinnat*** (Rich.) Gthr. Coasts of California to British Columbia. (*S. argyreus* Grd. *S. warreni* Suckl.)

§ *Hypsifario* Gill. 1864.

426. ***Oncorhynchus kennerlyi*** (Suckl.) Jordan. Sacramento River to British Columbia.

CHARACINIDÆ.

85.—ASTYANAX Baird & Girard. 1854.

(*Pœcilurichthys* Gill, 1858.)

427. ***Astyanax argentatus*** B. & G. Texas; Arkansas (*Le Sueur.*)

PERCOPSIDÆ.

86.—PERCOPSIS Agassiz. 1850. Trout Perches.

428. ***Percopsis guttatus*** Ag. Great Lake Region; south to the Delaware, Potomac, and Ohio Rivers.

ESOCIDÆ.

87.—ESOX Linnæus. 1758. Pikes.

§ *Mascalongus* Jordan. 1878.

429 ***Esox nobilior*** Thompson. Great Lake Region.

§ *Esox.*

430. *Esox lucius* Linnæus. Waters of Northern United States, British America, Europe, and Asia.

§ *Picorellus* Rafinesque. 1820.

431. *Esox reticulatus* Le Sueur. New England to Alabama, east of the Alleghanies.
432. *Esox salmoneus* Raf. Ohio Valley to Wisconsin.
433. *Esox raveneli* Holbr. South Carolina to Alabama. (*d. s.*)
434. *Esox americanus* Gmel. Massachusetts to Maryland.
435. *Esox cypho* Cope. Pennsylvania to Illinois.

AMBLYOPSIDÆ.

88.—CHOLOGASTER Agassiz. 1854. Ditch Fishes.

436. *Chologaster cornutus* Ag. Rice-ditches, South Carolina.
437. *Chelogaster agassizi* Putnam. Mammoth Cave and subterranean stream, Lebanon, Tenn.

89.—TYPHLICHTHYS Girard. 1859. Small Blind Fish.

438. *Typhlichthys subterraneus* Grd. Caves of Indiana and Kentucky.

90.—AMBLYOPSIS DeKay. 1842. Blind Fish.

439. *Amblyopsis spelæus* DeKay. Caves of the limestone regions of Indiana and Kentucky.

UMBRIDÆ.

91.—MELANURA Agassiz. 1854. Mud Minnows.

440. *Melanura limi* (Kirt.) Ag. Great Lake Region.
441. *Melanura pygmæa* (DeKay) Baird. Connecticut to South Carolina.

CYPRINODONTIDÆ.

92.—CYPRINODON Lacépède. 1803.

442. *Cyprinodon variegatus* Lac. Atlantic coast.
443. *Cyprinodon parvus* B. & G. Cape Cod to North Carolina. (*d. s.*)
444. *Cyprinodon elegans* B. & G. Rio Grande.
445. *Cyprinodon bovinus* B. & G. Texas.
446. *Cyprinodon macularius* B. & G. Rio Gila.
447. *Cyprinodon gibbosus* B. & G. Texas.
448. *Cyprinodon californiensis* Grd. San Diego, Cal.

93.—GIRARDINICHTHYS Bleeker. 1860.

449. *Girardinichthys innominatus* Bleeker. Mexico.

94.—LUCANIA Girard. 1859.

450. *Lucania venusta* Grd. Texas.
451. *Lucania affinis* Grd. Mexico. (*d. s.*)

95.—HYDRARGYRA Lacépède. 1803. May Fishes.

452. *Hydrargyra majalis* (Walb.) Val. Cape Cod to North Carolina.
453. *Hydrargyra swampina* Lac. North Carolina to Florida. (*d. s.*)
454. *Hydrargyra similis* B. & G. Florida to Texas.

96.—FUNDULUS Lacépède. 1803. Killifishes.

455. *Fundulus heteroclitus* (L.) Gthr. Cape Cod to Florida, entering streams.
456. *Fundulus pisculentus* (Mitch.) Val. Atlantic coast.
457. *Fundulus nigrofasciatus* (Le S.) Val. Atlantic coast.
458. *Fundulus diaphanus* (Le S.) Ag. Coasts; ascending all streams to their fountain-heads; hence inland to Michigan, Wisconsin, Colorado. (*F. multifasciatus* (Le S.) Val.)
459. *Fundulus menona* Jordan & Copeland. Rock River, Wis.; N. Ills.
460. *Fundulus zebra* (Grd.) Gthr. Rio Grande. (*d. s.*)
461. *Fundulus seminolis* Grd. Florida. (*d. s.*)
462. *Fundulus grandis* B. & G. Texas.
463. *Fundulus parvipinnis* Grd. San Diego, Cal.

97.—XENISMA Jordan. 1876. Stud-fishes.

464. *Xenisma stelliferum* Jordan. Alabama River.
465. *Xenisma catenatum* (Storer) Jor. Cumberland and Tennessee Rivers.

98.—ZYGONECTES Agassiz. 1854. Top Minnows.

§ *Zygonectes.*

466. *Zygonectes notatus* (Raf.) Jor. Michigan to Texas.
467. *Zygonectes floripinnis* (Cope) Jor. Colorado.

§ *Micristius* Gill. 1865.

468. *Zygonectes zonatus* (Mitch.) Jor. Cape Cod to Florida.
469. *Zygonectes cingulatus* (C. & V.) Jor. Cape Cod to Florida. (*d. s.*)
470. *Zygonectes chrysotus* (Gthr.) Jor. North Carolina to Florida. (*d. s.*)
471. *Zygonectes nottii* Ag. Georgia to Mississippi.
472. *Zygonectes sciadicus* (Cope) Jor. Platte River.
473. *Zygonectes melanops* (Cope) Jor. North Carolina to Illinois.
474. *Zygonectes guttatus* Ag. Alabama.
475. *Zygonectes dispar* Ag. Ohio to Missouri.
476. *Zygonectes hieroglyphicus* Ag. Alabama.
477. *Zygonectes brachypterus* (Cope), MSS. Texas.

99.—GAMBUSIA Poey. 1851.

478. *Gambusia holbrooki* (Ag.) Grd. Florida to Texas.
479. *Gambusia nobilis* B. & G. Texas.

480. *Gambusia affinis* B. & G. Texas. (*d. s.*)
481. *Gambusia patruelis* B. & G. Texas. (*d. s.*)
482. *Gambusia gracilis* Grd. Matamoras. (*d. s.*)
483. *Gambusia speciosa* Grd. New Leon. (*d s.*)
484. *Gambusia senilis* Grd. Chihuahua. (*d. s.*)

100.—MOLLIENESIA Le Sueur. 1821.

(*Limia* Poey, 1851.)

485. *Mollienesia latipinna* Le S. Florida to Texas.
486. *Mollienesia lineolata* Grd. Texas. (*d. s.*)
487. *Mollienesia formosa* (Grd.) Gthr. Mexico.
488. *Mollienesia matamorensis* (Grd.) Jor. Matamoras. (*d. s.*)
489. *Mollienesia pœcilioides* (Grd.) Jor. Texas. (*d. s.*)
490. *Mollienesia couchiana* (Grd.) Jor. New Leon.

101.—GIRARDINUS Poey. 1851.

491. *Girardinus formosus* (Ag.) Grd. South Carolina to Louisiana.
492. *Girardinus occidentalis* (B. & G.) Grd. New Mexico.
493. *Girardinus sonoriensis* Grd. Sonora; Arizona.

102.—ADINIA Girard. 1859.

494. *Adinia multifasciata* Grd. Texas.

ATHERINIDÆ.

103.—CHIROSTOMA Swainson. 1839. Silversides.

495. *Chirostoma notatum* (Mitch.) Gill. Maine to Florida.
496. *Chirostoma menidium* (L.) Gill. North Carolina to Florida.
497. *Chirostoma beryllinum* Cope. Maryland to Florida.

104.—ATHERINA Linnæus. 1758.

498. *Atherina carolina* Val. South Carolina.

105.—LABIDESTHES Cope. 1870.

499. *Labidesthes sicculus* Cope. Tennessee to Michigan.

APHODODERIDÆ.

106.—APHODODERUS Le Sueur. 1833. Pirate Perches.

500. *Aphododerus sayanus* (Gilliams) DeKay. New Jersey to Louisiana, chiefly coastwise.
501. *Aphododerus isolepis* (Nelson) Jordan. Mississippi Basin and Upper Lakes. (*d. s.*)

ELASSOMATIDÆ.

107.—ELASSOMA Jordan. 1877.

502. *Elassoma zonatum* Jordan. Illinois to Texas.

CENTRARCHIDÆ.

108.—MICROPTERUS Lacépède. 1800. Black Bass.

503. *Micropterus pallidus* (Raf.) Gill & Jordan. Red River of the North to Virginia, Florida, and Mexico. (*M. nigricans* (C. & V.) Gill.)
504. *Micropterus salmoides* (Lac.) Gill. Canada to Alabama and Florida.

109.—CHÆNOBRYTTUS Gill. 1862. War-mouths.

505. *Chænobryttus gulosus* (C. & V.) Gill. Upper Great Lakes; Mississippi Valley to Texas.
506. *Chænobryttus viridis* (C. & V.) Jor. Virginia to Florida.

110.—AMBLOPLITES Rafinesque. 1820. Rock Bass.

§ *Ambloplites.*

507. *Ambloplites rupestris* (Raf.) Gill. Lake Champlain to the Saskatchawan; south to Florida and Texas.
508. *Ambloplites cavifrons* Cope. Virginia; North Carolina.

§ *Archoplites* Gill. 1862.

509. *Ambloplites interruptus* Grd. Streams of the Pacific slope.

111.—ACANTHARCHUS Gill. 1864.

510. *Acantharchus pomotis* (Baird) Gill. New York to South Carolina.

112.—APOMOTIS Rafinesque. 1819.

511. *Apomotis cyanellus* (Raf.) Jor. Alleghanies to Great Plains and south.
512. *Apomotis signifer* (Grd.) Jor. Texas. (*d. s.*)
513. *Apomotis albulus* (Grd.) Jor. Texas. (*d. s.*)
514. *Apomotis phenax* Cope & Jordan. New Jersey.

113.—LEPIOPOMUS Rafinesque. 1819. Sunfishes.

§ *Lepiopomus.*

515. *Lepiopomus macrochirus* Raf. Ohio Valley to Illinois.
516. *Lepiopomus anagallinus* Cope. Kentucky to Kansas.
517. *Lepiopomus oculatus* Cope. Upper Mississippi Valley.
518. *Lepiopomus humilis* (Grd.) Cope. Texas.

519. *Lepiopomus mystacalis* Cope. Florida.
520. *Lepiopomus bombifrons* (Ag.) Jor. Tennessee River. (*d. g.*)
521. *Lepiopomus apiatus* Cope. Florida.
522. *Lepiopomus elongatus* (Holbr.) Gill & Jor. Florida.
523. *Lepiopomus miniatus* Jordan. Louisiana.
524. *Lepiopomus auritus* (L.) Raf. Maine to Florida, east of the mountains.
525. *Lepiopomus ischyrus* Jordan & Nelson. Illinois.

§ *Helioperca* Jordan. 1877.

526. *Lepiopomus pallidus* (Mit.) Gill & Jor. Canada to New Jersey, Florida, and Texas.
527. *Lepiopomus obscurus* (Ag.) Jor. Kentucky to Alabama.

114.—XYSTROPLITES Jordan. 1877.

528. *Xystroplites gillii* Jordan. Florida.
529. *Xystroplites longimanus* Cope. Florida.
530. *Xystroplites heros* (B. & G.) Jor. Texas.
531. *Xystroplites notatus* (Ag.) Jor. Tennessee River. (*d. g.*)

115.—XENOTIS Jordan. 1877. Long-eared Sunfishes.

532. *Xenotis inscriptus* (Ag.) Jor. Ohio to Missouri and south.
533. *Xenotis peltastes* (Cope) Jor. Michigan to Illinois.
534. *Xenotis marginatus* (Holbr.) Jor. Florida.
535. *Xenotis aureolus* Jor. Ohio Valley.
536. *Xenotis solis* (Val.) Gill & Jor. Louisiana.
537. *Xenotis lythrochloris* Jor. Ohio Valley.
538. *Xenotis sanguinolentus* (Ag.) Jor. South Carolina to Tennessee and Louisiana. (*d. s.*)
539. *Xenotis megalotis* (Raf.) Jor. Mississippi Valley.
540. *Xenotis popii* (Grd.) Jor. Texas. (*d. s.*)
541. *Xenotis breviceps* (B. & G.) Jor. Louisiana to Texas.
542. *Xenotis fallax* (B. & G.) Jor. Texas.

116.—EUPOMOTIS Gill & Jordan. 1877. Sunfishes.

543. *Eupomotis aureus* (Walb.) Gill & Jor. Minnesota to New England and south to Florida, east of the Alleghanies.
544. *Eupomotis speciosus* (Holbr.) Gill. Florida.
545. *Eupomotis pallidus* (Ag.) Gill & Jordan. Illinois to Alabama and southward.

117.—MESOGONISTIUS Gill. 1864.

546. *Mesogonistius chætodon* (Baird) Gill. New Jersey to Maryland.

118.—ENNEACANTHUS Gill. 1864.

547. *Enneacanthus obesus* (Grd.) Gill. Massachusetts to North Carolina.

548. ***Enneacanthus margarotis*** Gill & Jor. New Jersey to Virginia.
549. ***Enneacanthus pinniger*** Gill & Jor. North Carolina.
550. ***Enneacanthus gloriosus*** (Holbr.) Jor. Maryland to Florida.

119.—HEMIOPLITES Cope. 1868.

551. ***Hemioplites simulans*** Cope. Virginia.

120.—COPELANDIA Jordan. 1876.

552. ***Copelandia eriarcha*** Jor. Wisconsin.

121.—CENTRARCHUS Cuvier. 1829.

553. ***Centrarchus irideus*** (Lac.) C. & V. North Carolina to Illinois and south.
554. ***Centrarchus macropterus*** (Lac.) Jor. South Carolina to Alabama.

122.—POMOXYS Rafinesque. 1818. Grass Bass.

§ *Pomoxys.*

555. ***Pomoxys annularis*** Raf. Mississippi Valley.

§ ***Hyperistius*** Gill. 1864.

556. ***Pomoxys nigromaculatus*** (Le S.) Grd. New Jersey to Minnesota; south to Florida.

LABRACIDÆ.

123.—MORONE Mitchill. 1817. White Bass.

557. ***Morone americana*** (Gmel.) Gill. Atlantic coast and streams.
558. ***Morone interrupta*** Gill. Lower Mississippi Valley.

124.—ROCCUS Mitchill. 1817. Rockfish.

§ ***Lepibema*** Rafinesque. 1820.

559. ***Roccus chrysops*** (Raf.) Gill. Great Lakes; Upper Mississippi Valley.

§ ***Roccus.***

560. ***Roccus lineatus*** (Bloch) Gill. Atlantic coast and streams.

PERCIDÆ.

125.—PERCA Linnæus. 1758. Perches.

561. ***Perca americana*** Schranck. Minnesota to New England and south to Florida, east of the Alleghanies.

126.—STIZOSTETHIUM Rafinesque. 1820. Pike Perches.

§ *Stizostethium.*

562. ***Stizostethium vitreum*** (Mitchill) Jordan & Copeland. Great Lake Region, Canada, and southward. (Including var. *salmoneum* Raf.)

§ *Cynoperca* Gill & Jordan. 1878.

563. *Stizostethium canadense* (Smith) Jor. Saint Lawrence River to the Upper Missouri.

ETHEOSTOMATIDÆ.

127.—AMMOCRYPTA Jordan. 1877. Sand Divers.

564. *Ammocrypta beanii* Jordan. Louisiana.

128.—PLEUROLEPIS Agassiz. 1863. Pellucid Darters.

565. *Pleurolepis pellucidus* (Baird) Agassiz. Ohio Valley.
566. *Pleurolepis vitreus* (Cope) Jord. & Copel. North Carolina.
567. *Pleurolepis asprellus* Jordan. Illinois.

129.—PERCINA Haldeman. 1842. Log Perch.

568. *Percina caprodes* (Raf.) Grd. Great Lake Region to Alabama.
569. *Percina carbonaria* (B. & G.) Grd. Texas.
570. *Percina manitou* Jordan. Indiana to Minnesota.

130.—ALVORDIUS Girard. 1859. Black-sided Darters.

571. *Alvordius maculatus* Grd. Western streams. (*Etheostoma blennioides* Ag. *A. aspro* Cope & Jor.)
572. *Alvordius macrocephalus* Cope. Ohio Valley.
573. *Alvordius phoxocephalus* (Nelson) Cope & Jor. Indiana to Tennessee and Kansas.
574. *Alvordius crassus* Jordan & Brayton. Santee River.
575. *Alvordius nevisensis* Cope. North Carolina.
576. *Alvordius peltatus* (Stauffer) Cope & Jor. Conestoga River, Pennsylvania.

131.—ERICOSMA Jordan. 1877. Gilded Darters.

577. *Ericosma evides* Jordan & Copeland. Wabash Valley.

132.—HADROPTERUS Agassiz. 1854.

(*Hypohomus* Cope, 1870. *Plesioperca* Le Vaillant, 1873.)

578. *Hadropterus nigrofasciatus* Ag. South Carolina to Louisiana.
579. *Hadropterus tessellatus* Jor. Alleghany River.
580. *Hadropterus aurantiacus* (Cope) Jor. Virginia to Tennessee.

133.—IMOSTOMA Jordan. 1877. Big-headed Darters.

581. *Imostoma shumardi* (Grd.) Jor. Indiana to Iowa and Arkansas.

134.—RHEOCRYPTA Jordan. 1877.

582. *Rheocrypta copelandi* Jordan. Wabash Valley.

135.—DIPLESIUM Rafinesque. 1820. Green-sided Darters.

583. *Diplesium blennioides* (Raf.) Jor. Mississippi Valley.
584. *Diplesium newmani* (Ag.) Jor. & Copel. Tennessee River. (*d. s.*)
585. *Diplesium simoterum* (Cope) Copeland. Cumberland and Upper Tennessee Rivers.

136.—ULOCENTRA Jordan. 1878.

586. *Ulocentra stigmæa* Jor. Georgia to Louisiana.
587. *Ulocentra atripinnis* Jor. Cumberland River.

137.—BOLEOSOMA DeKay. 1842. Tessellated Darters.

588. *Boleosoma olmstedi* (Storer) Ag. Great Lakes to New England and southward, east of the Alleghanies.
589. *Boleosoma atromaculatum* (Grd.) Jor. New York to Virginia (? var.)
590. *Boleosoma maculatum* (Ag.) Jor. Mississippi Valley and Upper Great Lakes. (*Boleosoma brevipinne* Cope.)
591. *Boleosoma æsopus* Cope. Alleghany River. (*d. s.*)
592. *Boleosoma effulgens* (Grd.) Cope. Maryland to North Carolina.
593. *Boleosoma maculaticeps* Cope. North Carolina to Georgia.
594. *Boleosoma mesæum* (Cope) Jordan. Kansas. (*d. s.*)
595. *Boleosoma phlox* Cope, MSS. Texas.

138.—NANOSTOMA Putnam. 1877.

596. *Nanostoma zonale* (Cope) Jordan. Mississippi Valley.

139.—NOTHONOTUS Agassiz. 1863. Blue-breasted Darters.

597. *Nothonotus maculatus* (Kirt.) Ag. Ohio.
598. *Nothonotus camurus* (Cope) Jor. Ohio Valley.
599. *Nothonotus sanguifluus* (Cope) Jor. Cumberland River.
600. *Nothonotus vulneratus* (Cope) Jor. Tennessee to North Carolina.
601. *Nothonotus rufilineatus* (Cope) Jor. Kentucky to North Carolina.
602. *Nothonotus inscriptus* Jor. & Bray. Oconee River.
603. *Nothonotus thalassinus* Jor. & Bray. Santee River.

140.—PŒCILICHTHYS Agassiz. 1854. Variegated Darters.

604. *Pœcilichthys variatus* (Kirtland) Ag. Upper Mississippi Valley and tributaries of Lake Erie and Lake Michigan.
605. *Pœcilichthys spectabilis* Agassiz. Upper Mississippi Valley and tributaries of Lake Erie and Lake Michigan.
606. *Pœcilichthys jessiæ* Jor. & Bray. Tennessee River.
607. *Pœcilichthys lepidus* Grd. Texas and west.
608. *Pœcilichthys punctulatus* Agassiz. Missouri and Arkansas.
609. *Pœcilichthys leonensis* (Grd.) Jordan & Copeland. Texas.
610. *Pœcilichthys grahami* (Grd.) Jordan & Copeland. Texas.

141.—ETHEOSTOMA Rafinesque. 1819. Lined Darters.

(*Cotonotus* Agassiz, 1854.)

§ ———.

611. *Etheostoma squamiceps* Jordan. Kentucky.

§ *Etheostoma.*

612. *Etheostoma flabellare* Rafinesque. New York to Iowa and south.

142.—ALVARIUS Girard. 1859.

613. *Alvarius lateralis* Grd. Texas; Mexico.

143.—BOLEICHTHYS Girard. 1859. Red-sided Darters.

614. *Boleichthys exilis* Grd. Upper Missouri Region.
615. *Boleichthys eos* Jordan & Copeland. Upper Great Lakes and Upper Mississippi Valley.
616. *Boleichthys erochrous* (Cope) Jor. New Jersey to Maryland.
617. *Boleichthys elegans* Grd. Georgia to Texas.
618. *Boleichthys gracilis* (Grd.) Jor. Texas.
619. *Boleichthys fusiformis* (Grd.) Jor. Massachusetts.
620. *Boleichthys barratti* (Holbr.) Jor. North Carolina to Georgia.
621. *Boleichthys warreni* Grd. Upper Missouri Region.

144.—MICROPERCA Putnam. 1863. Least Darters.

622. *Microperca punctulata* Putnam. Upper Mississippi Valley and tributaries of Lake Michigan.

SCIÆNIDÆ.

145.—HAPLOIDONOTUS Rafinesque. 1819. River Drums.

623. *Haploidonotus grunniens* Raf. Great Lakes and Mississippi Valley.

146.—EUTYCHELITHUS Jordan. 1876. Malasheganay.

624. *Eutychelithus richardsonii* (C. & V.) Jor. Upper Great Lakes. (*d. s.*)

CICHLIDÆ.

147.—HEROS Heckel. 1840.

625. *Heros cyanoguttatus* (B. & G.) Jor. Texas.

COTTIDÆ.

148.—TRIGLOPSIS Girard. 1851.

626. *Triglopsis thompsoni* Grd. Great Lakes in deep waters.

149.—URANIDEA DeKay. 1842.

627. *Uranidea hoyi* Putnam. Lake Michigan.
628. *Uranidea franklini* (Ag.) Jor. Lake Superior.
629. *Uranidea kumlieni* Hoy. Lake Michigan.

630. *Uranidea formosa* (Grd.) Jor. Lake Ontario. (*d. s.*)
631. *Uranidea gracilis* (Heckel) Putn. New York and east.
632. *Uranidea gobioides* (Grd.) Jor. Lake Champlain. (*d. s.*)
633. *Uranidea boleoides* (Grd.) Jor. Lake Champlain. (*d. s.*)
634. *Uranidea viscosa* (Haldeman) Cope. Pennsylvania.
635. *Uranidea fabricii* (Grd.) Jor. Greenland.

150.—POTAMOCOTTUS Gill. 1861.

636. *Potamocottus bairdii* (Grd.) Gill. Ohio.
637. *Potamocottus alvordi* (Grd.) Gill. Great Lakes to Minnesota. (*d. s.*)
638. *Potamocottus meridionalis* (Grd.) Gill. Pennsylvania to Indiana; south to Alabama.
639. *Potamocottus wilsoni* (Grd.) Gill. Pennsylvania to Indiana. (*d. s.*)
640. *Potamocottus richardsoni* (Ag.) Gill. Lake Superior.
641. *Potamocottus punctulatus* Gill. Rocky Mountains.
642. *Potamocottus wheeleri* Cope. Utah; Colorado. (*d. s.*)
643. *Potamocottus cognatus* (Rich.) Gill. British America.
644. *Potamocottus gulosus* (Grd.) Jor. Oregon and California.

151.—COTTOPSIS Girard. 1850.

645. *Cottopsis asper* (Rich.) Grd. Columbia River.
646. *Cottopsis parvus* Grd. California. (*d. s.*)
647. *Cottopsis semiscaber* Cope. Idaho. (*d. g.*)

152.—TAURIDEA Jordan & Rice. 1878.

648. *Tauridea spilota* (Cope) Jordan & Rice. Deep water, Lake Michigan.

GADIDÆ.

153.—LOTA Cuvier. 1817. Lings.

649. *Lota lacustris* (Walb.) Gill. New England to Minnesota and northward.

GASTEROSTEIDÆ.

154.—EUCALIA Jordan. 1876. Brook Sticklebacks.

650. *Eucalia inconstans* (Kirt.) Jor. Western New York to Kansas and northward.

155.—APELTES DeKay. 1842. Smooth Sticklebacks.

651. *Apeltes quadracus* (Mit.) Brev. Atlantic coast and streams.
652. *Apeltes williamsoni* (Grd.) Jor. California.

156. PYGOSTEUS Brevoort. 1861. Many-spined Sticklebacks.

653. *Pygosteus occidentalis* (Cuv. & Val.) Brevoort. Newfoundland to Cape Hatteras. Var. *nebulosus* Agassiz, in the Upper Great Lakes.
654. *Pygosteus concinnus* (Rich.) Jor. Saskatchawan Region.
655. *Pygosteus mainensis* (Storer) Brev. Kennebec River.

157.—GASTEROSTEUS Linnæus. 1758. Sticklebacks

656. *Gasterosteus aculeatus* L. Greenland to Newfoundla
Europe.
657. *Gasterosteus biaculeatus* Shaw. Newfoundland and
(*d. s.*)
658. *Gasterosteus niger* Cuv. & Val. Newfoundland. (*d. s.*)
659. *Gasterosteus noveboracensis* Cuv. & Val. New Brunswi
Hatteras. (*d. s.*)
660. *Gasterosteus plebeius* Grd. California.
661. *Gasterosteus serratus* Ayres. Pacific coast.
662. *Gasterosteus intermedius* Grd. Washington Territory.
663. *Gasterosteus inopinatus* Grd. California.
664. *Gasterosteus microcephalus* Grd. Tulare Basin.
665. *Gasterosteus pugetti* Grd. Puget's Sound.

ART. XIX.—DESCRIPTION OF A FOSSIL PASSERINE BIRD FROM THE INSECT-BEARING SHALES OF COLORADO.

By J. A. Allen.

Plate I.

The species described in the present paper is based on some beautifully preserved remains from the insect-bearing shales of Florissant, Colorado. They consist of the greater part of a skeleton, embracing all of the bones of the anterior and posterior extremities (excepting the femora). Unfortunately, the bill and the anterior portion of the head are wanting, but the outlines of the remainder of the head and of the neck are distinctly traceable. The bones are all *in situ*, and indicate beyond question a high ornithic type, probably referable to the Oscine division of the *Passeres*. The specimen bears also remarkably distinct impressions of the wings and tail, indicating not only the general form of these parts, but even the shafts and barbs of the feathers.

In size and in general proportions, the present species differs little from the Scarlet Tanager (*Pyranga rubra*) or the Cedar-bird (*Ampelis cedrorum*). The bones of the wings, as well as the wings themselves, indicate a similar alar development, but the tarsi and feet are rather smaller and weaker; and hence in this point the agreement is better with the short-legged Pewees (genus *Contopus*). These features indicate arboreal habits and well-developed powers of flight. The absence of the bill renders it impossible to assign the species to any particular family, but the fossil on the whole gives the impression of Fringilline affinities.

PALÆOSPIZA BELLA, *gen. et sp. nov.*

Wings rather long, pointed; tail (apparently*) about two-thirds the length of the wing, rounded or graduated, the outer feathers (as preserved) being much shorter than the inner. One side shows distinctly six rectrices. Tarsus short, its length a little less than that of the middle toe. Lateral toes subequal, scarcely shorter than the middle one. Hind toe about two-thirds as long as the middle toe. Feet and toes strictly those of a perching bird, and the proportionate length of the bones of the fore and hind limbs is the same as in ordinary arboreal *Passeres*, especially as represented by the *Tanagridæ*.

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* The character of the tail must be given with reservation, since it is not quite certain that the whole of the tail, or that the exact form of the terminal portion, is shown, especially as the preserved impression is somewhat unsymmetrical.

One of the specimens affords the following measurements:–

Humerus, length
Forearm, length
Manus, length
Coracoid, length
Clavicle, length
Tibia, length
Tarsus, length
Middle toe and claw
Claw alone
Hind toe and claw
Claw alone
Wing
Tail (approximate)
Total length (approximate)

The bones still rest in the original matrix, and, being crushed and flattened, do not admit of detailed description parison with other types. The furculum is well preserved limb-bones are all in place in their natural relation. The s unrecognizable. The position of the cervical series of vert the general outline of the skull can be traced; but no struct acters of the head can be distinguished, except the proximal the mandible. The long bones all present a well-marked lo groove, due evidently to compression and fracture. This distinctly traceable, even in such slender bones as tibiæ, clavicles. In point of size, while the furculum and the bo wing have all about the same length as the corresponding *Ampelis cedrorum*, they apparently are considerably stout greater breadth may, however, be due simply to flattening sure. The tibiæ and tarsi are a little shorter than in the sp named, but the difference is only slight.

The most remarkable feature of the specimen is the definite feather impressions. Both the shafts and the barbs are sl great distinctness in the rectrices, and the tips of the primar wing are also sharply defined, overlying the edge of the partly tail. The tip of the opposite wing can also be seen beneat The feet are so beautifully preserved that even the claws are distinct. (Plate I, fig. 1.)

Another specimen from the same locality, and probably re the same species, consists of the tip of the tail and about third of a half-expanded wing. (See Plate I, fig. 2.) In thi the tail is also pointed and graduated. About seven of the maries of the wing are shown with great distinctness, and t can be easily made out. The third primary is the longest; t is slightly shorter; the first and fourth are about equal. The in the collection three detached contour feathers of small size, bu pertaining to the same species as the other specimens cannot, be determined.

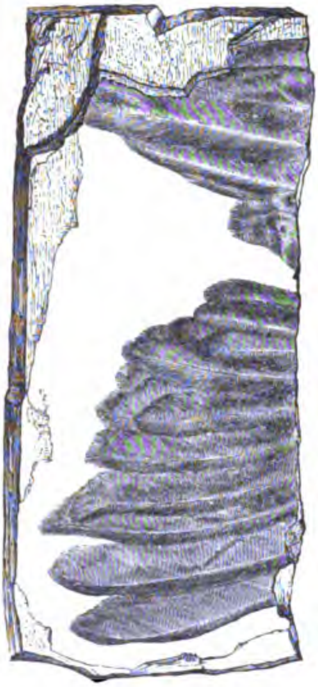

FIG. 2.

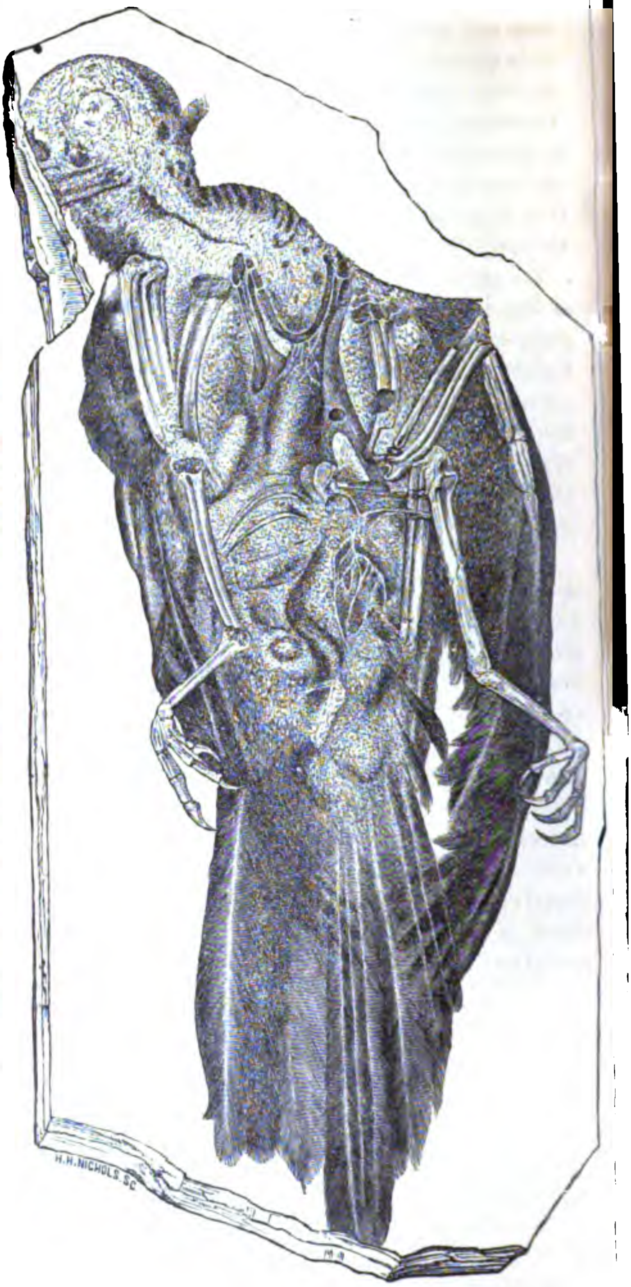

FIG. 1.

Palæospiza bella, Allen.

The larger specimen, first described, is divided into an upper and a lower half, the greater part, however, adhering to the lower slab. The bones adhere about equally to the two faces. The drawing is made from the lower slab, with some of the details filled in from the upper one. The feather impressions are about equally distinct on both, and where in either case the bones are absent, exact molds of them remain, so that the structure can be seen and measurements taken almost equally well from either slab, except that nothing anterior to the breast is shown on the upper slab.

The species here described is of special interest as being the first fossil Passerine bird discovered in North America, although birds of this group have been known for many years from the Tertiary deposits of Europe. The highest extinct ornithic type hitherto known from America is a Picarian bird (*Uintornis lucaris*) related to the Woodpeckers, described by Prof. O. C. Marsh in 1872, from the Lower Tertiary of Wyoming Territory. Probably the insect-bearing shales of Colorado will afford, on further exploration, other types of the higher groups of birds.

For the opportunity of describing these interesting specimens I am indebted to Mr. S. H. Scudder, who obtained them during his last season's (1877) explorations of the Florissant insect-beds. The specimens are now the property of the Boston Society of Natural History. My thanks are due to Mr. J. H. Blake for the great care with which he has executed the drawings.

In conclusion, I may add that in 1871 I obtained a few distinct impressions of feathers from beds of the same age and from near the same locality. The first fossil feather, to my knowledge, discovered in North America was obtained by Dr. F. V. Hayden in 1869, from the freshwater Tertiary deposits of Green River, Wyoming Territory. This was described by Professor O. C. Marsh in 1870,* who refers to it as "the distal portion of a large feather, with the shaft and vane in excellent preservation".

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* Am. Journ. Sci. and Arts, 2d ser., vol. xi, 1870, p. 272.

ART. XX.—THE COLEOPTERA OF THE ALPINE REGIONS OF THE ROCKY MOUNTAINS.

BY JOHN L. LECONTE, M. D.

The elevated interior region of North America presents peculiarly favorable opportunities for the study of some of the most interesting questions connected with geographical distribution of animals and plants.

If the materials at our hands be, as indeed they yet are, a very scanty representation of the organic forms now living in that part of the continent, they are, at least, sufficient to indicate the direction in which investigations should be pushed, in order to arrive at definite and final results.

The peculiarly favorable circumstances to which I chiefly refer at present are dependent on the following points in the development of the region:—

1st. The gradual enlargement of the land-surface at the expense of the circumambient seas during the latest Mesozoic periods.

2d. The gradual elevation of the middle of the continental mass during post-Cretaceous times, so as to greatly modify the climate in respect to both moisture and temperature. These changes have been so gradual, that we may say with certainty (excluding the local eruptive phænomena, which were more numerous, but not remarkably different from those of the present age) there has been no great or paroxysmal disturbance destructive of the land-surface in the elevated plains east of the Rocky Mountains since the deposition of our early Cretaceous strata (Dakota Group).

3d. While, during the Glacial epoch, the valleys of the mountains were filled with glaciers of moderate size, and the line of permanent ice streams and fields brought to a much lower level, there was an absence of the extensive ice sheets and flooded areas, which in Eastern America destroyed entirely the terrestrial organized beings of the former period.

It must be inferred from the first and second of these premisses, that the new land exposed by this gradual development of the continent received its colonies of animals and plants from the conterminous older land-surfaces in various directions, and that the subsequent elevation of the continental mass, by which the moisture was diminished, caused a later invasion of the territory by those genera and species which are characteristic of arid regions.

We may also conclude, from the third premiss, that the glacial displacement of species in the Rocky Mountains has been much less than in Eastern America, and that a very small area would be left bare of life on the return to a normal temperature; consequently, the previous occupants of the higher mountains would again return to their former domain, increased by refugees from the circumpolar continent of temperate climate, driven southward by the increasing cold.

Such being the case, it ought to be possible, with well-prepared lists of the insects of the Plains and mountain regions, by comparison with lists of the local faunæ of other zoological districts of the continent, to ascertain, with reasonable probability, the invasions from different directions by which, in the first place, the newly emerged land was colonized; and, in the second place, the modifications, either in distribution or in structure, which have subsequently occurred.

I have on another occasion* expressed my belief that the study of the distribution of existing insects could give much information concerning former topographical and geographical changes in the surface of the earth. I then gave several examples to show how the distribution of species peculiar in their habits and structure confirmed what was already known by geological investigation of the gradual evolution of the middle part of the continent. I will now advance the additional thesis, that we may obtain somewhat definite information of the sequence, extent, and effects of geological changes in the more recent periods by a careful study of the insect fauna in its totality.

While these pages were being prepared, I received from Mr. T. Vernon Wollaston † a copy of his excellent volume on the small Coleopterous fauna of Saint Helena. This fauna, containing but 203 species, is remarkable for the large predominance of *Rhynchophora*, of the families *Cossonidæ* and *Anthribidæ.* It has, however, been greatly contaminated by the introduction, through commerce, of foreign species to the number of 74, or nearly three-eighths of the number now known to inhabit the island. The introduction of these 74 exotic species, in addition to the other changes produced by human agency, must have greatly modified the pre-existing fauna, by repressing some and extinguishing others of the aboriginal species.

In the case of a portion of a continental area, such as is under consideration for my present purpose, the problems are by no means so simple. The human agency in the introduction of foreign species is slight. The geological and meteorological changes are all-powerful in increasing or diminishing the districts of distribution, and in determining the directions from which additions to the fauna may have been made. I have purposely avoided mentioning in the discussion among these categories the modification *in situ* of pre-existing forms, because this is an influence which is easily invoked and but rarely manifested. Its effects, therefore, if capable of being demonstrated, can be appreciated better only after the elimination of the coarser and more tangible machinery of topography and climate in producing migrations.

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* Trans. Am. Assoc. Adv. Science, 1875, Detroit, President's Address.

† Since writing the above paragraph, I have been informed of the death of this most estimable and laborious investigator. The last of his publications was the memoir on the Coleoptera of Saint Helena, referred to in the text. The monographs of the Coleopterous faunæ of the Atlantic Islands by Mr. Wollaston are among the most complete and exhaustive contributions to faunal Entomology published. Their full importance can only be appreciated when more thorough investigations of the Beetles of the American and African Atlantic slopes are made and careful comparisons instituted. It will then be found that several genera of the Atlantides which do not occur on the other continent are represented in the American faunæ.

DESCRIPTIONS OF NEW SPECIES.

I avail myself of the present opportunity to describe several species from Colorado, which have the appearance of being mountain species, though their localities are not definitely known to me. For the purpose of making this memoir more useful to those who will pursue the investigation, I have availed myself of the kindness of Mr. O. Reinecke, of Buffalo, who has submitted to me a very good set of species collected last summer at Atlanta, Idaho, by Mr. L. Allgewahr. Several new forms were contained in this series, and a complete list of all the species collected is added as an appendix. The elevation of Atlanta is estimated at about 7,800 feet.

The *Nebriæ* mentioned in the list of Alpine species are fully described in the short essay on the North American species of that genus, added as a second appendix.

CARABIDÆ.

1. PTEROSTICHUS (CRYOBIUS) SURGENS, *n. sp.*

Shining black, with bronze-brown lustre; antennæ dark brown; palpi and legs red-brown. Prothorax wider than long, rounded on the sides for two-thirds the length, narrowed behind, and sinuate towards the base; basal angles rectangular; anterior transverse impression well defined, dorsal line distinct, basal impressions double, the inner one long and deep, the outer one short and fine; base not margined. Elytra not wider than prothorax, elongate-oval, humeri not rounded; striæ fine, interspaces flat, 3d with two dorsal punctures situated on the 2d stria behind the middle. Length 8.5^{mm} (0.34 inch). Alma (10,000 feet), Argentine Pass (13,000 feet), Colorado. Closely allied to *P. fatuus* from Alaska, but the prothorax is not so broad, and the sides are much less rounded and less sinuate towards the base.

2. PLATYNUS JEJUNUS, *n. sp.*

Elongate and very slender, piceous, not shining. Head narrow, eyes small, not prominent. Antennæ half as long as the body, 3d joint a little longer than the 4th. Prothorax elongate-oval, narrower behind, sides very slightly sinuate near the base, reflexed margin narrow, not wider behind, basal angles rectangular, but not prominent, and slightly rounded at tip; disc flat, dorsal line fine, basal impressions small. Elytra elongate-oval, flat, finely striate, narrowly margined, obliquely sinuate towards the tips, which are divergent and separately rounded (♀), or nearly acute (♂). Length 10.5–13.3$^{\mathrm{mm}}$ (0.42–0.52 inch).

Mountains of California, Oregon, Nevada, and Idaho. Very similar to *P. dissectus*, but the surface is not shining; the side-margin of the prothorax is not wider towards the base, and the basal angles are less elevated. The elytra are less strongly margined, and more finely striate. The species of *Platynus* which constitute the subgenus *Rhadine* may be separated as follows:—

The form is very slender; front tarsi without grooves; middle and hind tarsi with lateral grooves. Hind angles of prothorax well defined. Elytra elongate-oval, flat, strongly margined, obliquely sinuate towards the tips, which are divergent. Color brown or blackish; antennæ and legs paler.

Third joint of antennæ much longer than the fourth ....2.
Third joint of antennæ but little longer than the fourth..................3.
2. Apical angles of elytra less acute ....*larralis.*
Apical angles very long, divergent......................*caudatus.*
3. Shining..*dissectus.*
Subopake..*jejunus.*

3. AMARA (CURTONOTUS) CYLINDRICA, *n. sp.*

One ♂ from South Park, Colorado, (8,000 to 10,000 feet), agrees with a specimen from Slave Lake, and is very near to others from Lake Winnipeg. It is allied to *A. lacustris* Lec., but the elytra are more convex and narrower, and the color is darker, with a distinct metallic gloss. The sides of the prothorax are rounded almost to the base, the sinuosity is very short, but the hind angles are equally prominent. The metathoracic side pieces are marked with a stria each side, and scarcely punctured. The 1st and 2d ventral segments are feebly punctured, and there are a few scattered punctures at the side of the metasternum. The legs are dark brown; the upper tooth of the inner side of the middle tibiæ is acute and prominent, the lower one is very small. Length 10$^{\mathrm{mm}}$ (0.40 inch).

4. HARPALUS CLANDESTINUS, *n. sp.*

Elongate, oblong-oval, piceous-brown, antennæ, palpi, and legs rufo-testaceous. Prothorax wider than long, sides rounded in front, then nearly straight, but very feebly sinuate to the hind angles, which are rectangular, not at all rounded; base emarginate, side-margin more reflexed than usual, explanate and sparsely punctulate towards the base; basal impressions narrow, slightly punctured. Elytra not wider than prothorax, striæ deep, impunctured, interspaces slightly convex; dorsal puncture upon 3d stria; outline oblique towards the tip, but not sinuate. Abdomen with accessory setæ, 1st segment punctured behind the coxæ. Length 8.5^{mm} (0.35 inch.)

Garland, Col., (8,000 feet); one ♂. Resembles *H. furtivus*, but differs by the hind angles of the prothorax being rectangular and not rounded.

5. **Bembidium Bowditchii**, *n. sp.*

Dark bluish or bronze, not shining. Prothorax wider than long, narrower in front, sides broadly rounded, broadly sinuate behind the middle; hind angles divergent, base obliquely truncate each side, basal impressions small. Elytra wider than the prothorax, basal carina short, making an acute angle with the margin; striæ strongly punctured before the middle, fine and impunctured towards the tip: interspaces flat, dorsal punctures two, situated near the 3d stria. Beneath greenish-bronze, shining. Length 5.5^{mm} (0.22 inch).

Green River City, Wyoming, (6,000 to 7,000 feet). Closely allied to *B. nitidulum*, but differs from it by the prothorax being not narrowed behind, and having the hind angles divergent.

It is interesting to observe that the difference in the prothorax between this species and *B. nitidulum* is precisely that exhibited in the allied group, having impressed quadrate elytral spots between *B. Lorquinii* and *impressum*.

I feel much pleasure in dedicating this species to Mr. F. C. Bowditch, to whom we owe the first useful material for the investigation of the Alpine Coleopterous fauna of the interior of the continent.

6. **Bembidium Scudderi**, *n. sp.*

Depressed, brownish-black, slightly bronzed, antennæ and legs paler brown. Prothorax wider than long, rounded on the sides, narrowed, but scarcely sinuate behind the middle; hind angles rectangular, prominent, very finely carinate; dorsal line deep, basal impressions wide, finely rugose. Elytra elongate-oval, a little wider than the prothorax, striæ fine, closely punctulate in front, smooth behind: interspaces flat, 3d with two dorsal punctures. Length 5.3^{mm} (0.20 inch).

Salt Lake Valley (4,300 feet). Belongs to the section *Notaphus*, and easily recognized by the elytra having no testaceous markings, with the unusual number of three dorsal punctures, and by the form of the prothorax.

This species is named after Mr. S. H. Scudder, whose extensive researches in *Orthoptera* and *Lepidoptera* are world-known. The object of the journey, in which he was accompanied by Mr. Bowditch, was to explore the clay beds of Tertiary age, which abound in fossil insects. The large collection obtained will be described by him in future numbers of this Bulletin.

The elevation at which the specimen was collected is below the limit treated of in this memoir; but as it has not occurred elsewhere, it is probably not confined to the inferior levels. It is, moreover, a very interesting species, and well deserving attention.

DYTISCIDÆ.

7. HYDROPORUS CONGRUUS, *n. sp.*

Broadly ovate, more pointed behind, not convex, black: head, antennæ, legs, and elytra testaceous, the latter with the suture, part of side-margin, and several discoidal stripes black; the latter are confluent in places. Prothorax piceous; sides oblique, nearly straight, forming an obtuse angle with the elytra; sides extremely finely margined; disc smooth, slightly rugose towards the hind angles, feebly depressed near the base; marked each side with a curved line extending from the base to beyond the middle. Length 2.5^{mm} (0.10 inch).

Florissant, Colo., (8,000 feet); one specimen. Seems to be related to the European *H. assimilis*.

8. GAURODYTES NANUS, *n. sp.*

Elongate-oval, more narrowed behind, black, antennæ, palpi, and legs rufo-testaceous; elytra brown towards the sides, reticulate in rather large meshes by fine lines, with scattered accessory punctures behind the middle. Head with two red occipital spots. Prothorax reticulate like the elytra, brown towards the sides, which are narrowly margined and slightly curved near the front angles. Hind tibiæ without punctures at the inner margin. Length 6.5^{mm} (0.25 inch).

Florissant, Colo., (8,000 feet); one ♂. Allied to *G. strigulosus* Crotch, but narrower and more convex, and without even a short row of punctures at the inner edge of the hind tibiæ. Tarsi moderately dilated; claws small, the front ones not toothed.

STAPHYLINIDÆ.

9. GEODROMICUS OVIPENNIS, *n. sp.*

Black, shining, sparsely and finely pubescent. Head deeply impressed as usual, sparsely punctured. Prothorax ovate, convex, a little wider than long; sides oblique behind, feebly sinuate; hind angles rectangular, slightly depressed; base marked with a transverse fovea at the middle; surface not densely punctured; dorsal channel feebly impressed. Elytra at base not wider than the widest part of the prothorax, much wider behind, with the sides oblique; convex, rather densely punctured. Abdomen finely punctulate. Palpi and tarsi piceous. Length 4.3^{mm} (0.17 inch).

Leavenworth Valley, above Georgetown, Colo., (9,000 to 10,000 feet); July; one specimen. Resembles black specimens of *G. verticalis*, but the prothorax is narrower, more convex, and less punctured, and the elytra are much narrower at the base. It seems to correspond with the race *G. plagiatus* of Europe (Fauvel, Faune Gallo-Rhenane, 108). It is, however, so different from our two other species that I must regard it as different from them.

10. **Orobanus simulator**, *n. g. et sp.*

Elongate, graceful in form, resembling a *Lesteva*, brown or piceous black, shining, sparsely and finely pubescent, finely and densely punctured. Head convex, with two long impressions; ocelli distant, situated farther back than the hind margin of the eyes. Sides rounded behind the eyes; neck not very slender. Antennæ slender, one-half as long as the body, very little thickened towards the extremity, 2d joint a little shorter than the others. Prothorax scarcely wider than the head and eyes; ovate narrowed behind; sides oblique and strongly margined for the posterior two-thirds of their length, impressed with a large lateral fovea, anterior to which they are rounded and finely margined; disc convex, obsoletely channelled, feebly impressed near the base. Elytra more than twice as long as the prothorax, narrow at base, wider behind, separately much rounded at tip. Abdomen finely punctulate. Length 3^{mm} (0.12 inch).

Leavenworth Valley (9,000 to 10,000 feet); also found in Vancouver Island and at Gilroy and Holcomb Valley, California. The last joint of the maxillary palpi is much smaller than in *Micrœdus Austinianus*, and acicular. This, taken with the peculiar form of the prothorax and deep lateral impression, indicates the propriety of placing it as a distinct genus.

COCCINELLIDÆ.

11. **Brachiacantha ursina.**

Beaver Creek, Colorado, (6,000 feet). Two specimens were collected, in which the basal spot of the elytra is represented by a transverse band; in one specimen the discoidal spot is also wanting.

12. **Scymnus nigripennis**, *n. sp.*

Oval convex, ferruginous, darker beneath. Head and prothorax very finely sparsely punctulate, the latter with a transverse piceous cloud at the base. Elytra finely, not densely, punctured (pubescence rubbed off), entirely black. Postcoxal arcs of 1st ventral segment entire, extending to the hind margin of the segment. Beneath densely punctured. Length 2.5^{mm} (0.10 inch).

Florissant, Colo., (8,000 feet).

SCARABÆIDÆ.

13. **Aphodius aleutus**, *Esch.*

Leavenworth Valley, above Georgetown, Colo., (10,000 to 11,000 feet). One specimen, which agrees with the detailed description of Baron von Harold (Berl. Ent. Zeitschr. 1863, 372) and with others from Vancouver Island.

14. **Aphodius bidens**, *n. sp.*

Of the same form as *A. aleutus*, shining brown, cylindrical, convex; elytra ferrugineous. Head slightly rugose, tuberculate, hemihexagonal, emarginate in front, with acute prominent angles, sides oblique, edge reflexed, genæ prominent subacute. Prothorax one-half wider than long, sides parallel, finely margined, anterior and posterior angles rounded, base very finely margined; surface sparsely finely punctured, punctures more numerous at the sides. Elytral striæ punctured, interspaces very slightly convex, scarcely visibly sparsely punctulate. Mesosternum not carinate, opake, finely alutaceous, with a very faintly impressed median line in front. Spinules of hind tibiæ very short, equal. Length 6.8^{mm} (0.27 inch). Colorado. One specimen, in Dr. Horn's collection.

15. APHODIUS DUPLEX, *n. sp.*

Subcylindrical, piceous black, shining. Head convex, tuberculate, finely punctured, epistome rugose, broadly subemarginate in front, sides finely margined, genæ rounded, not prominent; the three tubercles of the vertex are rounded, the frontal one is replaced by a narrow transverse ridge parallel with the anterior margin of the epistome. Prothorax about twice as wide as long, narrower in front, sides and angles rounded, finely margined; base equally finely margined; surface finely, not densely, punctured, with large punctures sparsely intermixed; sides yellowish towards the front angles. Scutellum very sparsely punctulate. Elytral striæ deep-punctured, interspaces slightly convex, very finely and sparsely punctulate. Mesosternum alutaceous opake, very finely channelled in front. Spinules of hind tibiæ short, equal. Antennæ and legs brown. Length 4.1^{mm} (0.16 inch).

Colorado, Dr. Horn. Similar in form and size to *A. granarius*, but quite different by the head from any species known in our fauna.

16. APHODIUS OBTUSUS, *n. sp.*

Elongate, cylindrical, piceous; sides of prothorax, antennæ, palpi, legs, and elytra dull yellow. Head not tuberculate, sparsely punctulate; epistoma obtusely rounded and subtruncate in front, without prominent angles; sides oblique, flattened, rugose, genæ moderately prominent, rounded at tip. Prothorax wider than long, sides finely margined, feebly rounded, hind angles very much rounded; base finely margined; surface not densely, nor coarsely, but moderately and equably punctured, gradually paler towards the sides. Scutellum flat, smooth. Elytra with rather strongly punctured striæ; interspaces slightly convex, sparsely punctulate. Mesosternum opake, densely punctured in front, finely alutaceous behind, with a slender but well-defined impressed median line extending from the coxæ as far as the punctured part. Spinules of hind tibiæ equal, short. Length 6^{mm} (0.25 inch).

Colorado (locality unknown); one specimen, in Dr. Horn's collection. This very distinct species belongs to a separate group after G, of Dr. Horn's revision (Trans. Am. Ent. Soc. 1870, 110). It is easily recognized by the finely channelled mesosternum.

17. APHODIUS CRIBRATUS, *n. sp.*

Elongate, convex, shining black. Head coarsely punctured behind; epistoma rugose, and slightly granulate at the sides, not tuberculate, deflexed towards the anterior margin, which is truncate and not emarginate; angles very much rounded, sides oblique, finely margined, genæ prominent, rounded at tip. Prothorax more than twice as wide as long, narrowed behind, sides and angles rounded, distinctly margined; base not sinuate, as strongly margined as the sides; surface with large punctures, sparsely and irregularly placed. Elytra rounded on the sides near the base, which is truncate; humeri not prominent, but not rounded; striæ very coarsely punctured, or, rather, cribrate; interspaces slightly convex, smooth. Mesosternum densely punctured. Spinules of hind tibiæ equal. Length 5.3^{mm} (0.22 inch).

Oregon, two specimens. Allied to *A. cadaverinus* and *nevadensis*, but differs by the very coarsely punctured elytral striæ.

18. APHODIUS ANTHRACINUS, *n. sp.*

Elongate, convex, shining black. Head not densely but strongly punctured, armed with three small tubercles, of which the middle one in the ♂ is more elevated and subacute; epistoma obtusely emarginate, angles broadly rounded, not prominent; genæ rounded. Prothorax nearly twice as wide as its length, narrower in front, sides rounded as far as the middle, then nearly parallel to the hind angles, which are slightly rounded, base scarcely subsinuate; sides and base finely margined; disc not densely punctured, punctures of two sizes, about equally intermixed; there is a narrow, indistinct, smooth, dorsal stripe. Elytra with deep-punctured striæ, interspaces slightly convex, with very fine punctures, arranged almost in rows adjacent to the striæ. Mesosternum opake, very finely alutaceous, not carinate. Spinules of hind tibiæ unequal. Length 7^{mm} (0.28 inch).

American Fork Cañon, Utah, (9,500 feet); one specimen. Another specimen from Utah was kindly given me by Dr. Horn. Belongs near *A. leopardus* Horn. The elytra are obsoletely spotted in one specimen.

19. APHODIUS BREVICOLLIS, *n. sp.*

Elongate cylindrical, black, shining. Head not tuberculate, finely punctulate, epistoma broadly emarginate in front, angles very obtuse and rounded, sides oblique, flattened, rugulose, margin reflexed; genæ prominent, rounded at tip. Prothorax about twice as wide as long, sides nearly straight, margin strongly reflexed, front and hind angles narrowly rounded; base bisinuate, not margined; disc smooth, with scattered large punctures near the sides, which are broadly explanate. Elytra narrower than the base of the prothorax, striæ finely punctured, interspaces nearly flat, smooth. Metasternum flat, alutaceous, opake, not carinate, punctured only on the sides far in front. Legs dull red-brown, spinules of hind tibiæ unequal. Length 8^{mm} (0.30 inch).

Nebraska (locality unknown); one specimen, in Dr. Horn's collection.

This species and the three following belong to a division of Dr. Horn's group L, with *A. politus*, characterized by having the base of the prothorax not margined. The species are separated mainly by the punctuation of the prothorax and the degree of flattening of the sides.

20. APHODIUS MARGINATUS, *n. sp.*

Elongate, cylindrical, of the same size and form as *A. brevicollis*, black, shining; elytra dark brown. Head not tuberculate, finely punctured, epistoma broadly emarginate, angles very obtuse and rounded, sides oblique, explanate, and reflexed: genæ prominent, rounded at tip. Prothorax twice as wide as long, sides strongly margined, nearly straight, front and hind angles rounded, base bisinuate, not margined: surface deeply but not very coarsely punctured, punctures more distant towards the middle. Scutellum sparsely punctured. Elytra at the base narrower than the prothorax, striæ punctulate, interspaces slightly convex, sparsely but distinctly punctulate. Mesosternum opake, alutaceous, not carinate. Spinules of hind tibiæ unequal. Length 8^{mm} (0.30 inch).

Eastern Nevada; one specimen, in the collection of Dr. Horn.

21. APHODIUS PHÆOPTERUS, *n. sp.*

Of the same form as *A. cruentatus*, but differs by the genæ being more prominent, and much less rounded, and by the vertex more distinctly elevated at the middle; by the punctures of the prothorax being more numerous, and the sides being more distinctly flattened along the margin, especially near the front angles: the base is very indistinctly and imperfectly margined. The color is piceous, with the sides of the head and prothorax brownish. Antennæ, palpi, legs, and elytra dull ferruginous. Elytral striæ well-impressed, finely punctulate, interspaces slightly convex, obsoletely sparsely punctured. Mesosternum flat, opake, finely alutaceous, not carinate. Spinules of hind tibiæ unequal. Length 7^{mm} (0.28 inch).

Atlanta, Idaho, (7,800 feet); one specimen, given me by Mr. Reinecke.

22. APHODIUS CRUENTATUS, *n. sp.*

Elongate, convex, shining black, elytra dark dull red, legs very dark brown. Head not tuberculate, but with the vertex slightly elevated, very finely punctulate, clypeus very broadly and feebly emarginate in front, angles obtuse, much rounded, sides broadly flattened, feebly punctured, reflexed edge very narrow; genæ rounded. Prothorax nearly twice as wide as long, sides broadly rounded, especially in front of the middle; base rounded, slightly bisinuate, finely margined; at the sides near the base is a small shallow impression; disc finely punctured, with somewhat larger punctures intermixed more densely at the sides and along the base. Elytra deep red, striæ finely punctured, interspaces slightly convex, scarcely perceptibly punctulate. Mesosternum opake, alutaceous, with a narrow, smooth, median stripe, not carinate. Spinules of hind tibiæ unequal. Length 7.2^{mm} (0.29 inch).

Northern New Mexico; one specimen, collected by Lieut. W. L. Carpenter, United States Engineers, while attached to the Geographical Survey West of 100°, under Lieut. George M. Wheeler.

23. APHODIUS SUBTRUNCATUS, *n. sp.*

Elongate convex, piceous-black, shining, elytra, sides of prothorax, antennæ, palpi, and legs yellow. Head smooth, not tuberculate; epistoma margined, margin sparsely punctured, subtruncate in front, without angles; genæ prominent, rounded. Prothorax sparsely punctulate, with some scattered punctures at the sides and towards the base, sides very finely margined, base and hind angles rounded, the former very finely margined. Scutellum and sutural margin of elytra black; striæ deep, punctured, interspaces slightly convex, scarcely punctulate, slightly pubescent. Mesosternum opake, alutaceous, not carinate. Spinules of hind tibiæ unequal, some of them very long. Length 5^{mm} (0.20 inch).

Colorado (locality unknown); one specimen, collected by the Scientific Expedition of the University of Kansas, given me by Prof. F. H. Snow; two others from Mr. Ulke. The pubescence is very easily abraded.

24. APHODIUS SCABRICEPS, *n. sp.*

Elongate, cylindrical, brown, head and sides of prothorax yellow-brown, legs, antennæ, palpi, and elytra dull yellow. Head rugosely punctured, almost scabrous in front, epistoma emarginate in front, with broadly rounded angles: sides oblique, genæ but slightly prominent. Prothorax a little narrower in front, with subacute angles, sides finely margined, hind angles strongly rounded, base slightly bisinuate, very finely margined; surface not densely punctured. Scutellum dark brown, sparsely punctured. Elytral striæ strongly punctured, interspaces slightly convex, each with an irregular row of small punctures. Mesosternum nearly flat, opake, alutaceous, not carinate, slightly convex, and shining at the middle in front. Spinules of hind tibiæ unequal. Length 3^{mm} (0.12 inch).

Colorado; a specimen, given me by Dr. Horn. This very pretty little species is peculiar by the rough sculpture of the head, which seems to be almost granulose in places; it resembles in this character *A. rugifrons* Horn. It belongs, however, to a different group, as the spinules of the hind tibiæ are unequal, and should for the present remain in group L.

25. APHODIUS EXPLANATUS, *n. sp.*

Elongate, convex, blackish-piceous; antennæ, palpi, legs, sides of prothorax, and the elytra dull rufo-testaceous. Head with three very small obsolete tubercles, finely punctured, epistoma broadly emarginate, angles obtuse, not prominent, sides straight, oblique, finely margined, genæ prominent, slightly rounded. Prothorax about twice as wide as long, densely punctured, punctures larger towards the sides, which are rounded at base and near the front angles, with a faintly impressed dorsal line behind the middle: disk broadly explanate at the sides, which are finely margined; base finely margined, slightly bisinuate. Scutellum brown, slightly concave. Elytral striæ impressed, punctured, interspaces slightly convex, distinctly punctulate; mesosternum flat, opaque, alutaceous, carinate near the coxæ. Spinules of hind tibiæ much worn, but apparently unequal. Length 8.6^{mm} (0.34 inch).

Colorado; one specimen, collected by the Scientific Expedition of the University of Kansas, given me by Prof. F. H. Snow. This is a fine species, easily distinguished by the flattened sides of the prothorax and the carinate mesosternum. The tubercles of the head are very faint, and indicate that it should be placed near group I of Dr. Horn. The color gives it a superficial resemblance to *A. rubripennis* Horn, but the characters are very different.

26. APHODIUS RUDIS, *n. sp.*

Elongate, cylindrical, chestnut-brown, shining. Head punctulate, not tuberculate; epistoma broadly and feebly emarginate in front, angles dentiform acute, sides nearly straight, oblique, flattened, finely margined, sparsely fimbriate with short stiff setæ; genæ prominent, subacute. Prothorax more than twice as wide as long, sides slightly rounded, flattened, and strongly margined, obliquely truncate and sinuate near the base, which is also slightly bisinuate and not margined; surface finely punctulate, and with large shallow punctures, which are absent from a transverse space extending from the front margin for one-fourth the length, prolonged backwards along the middle to within one-fourth of the base; there are also two small smooth spaces at the basal margin. Elytral striæ finely punctured, interspaces nearly flat and smooth, humeri rounded, not dentiform. Mesosternum strongly and densely punctured, not carinate. Spinules of hind tibiæ unequal. Length 6.4^{mm} (0.25 inch).

Colorado; one specimen, given me by Prof. F. H. Snow. This species belongs to the same group (O) with *A. ovipennis* Horn, but is abundantly distinct by form and color, by the sides of the prothorax being strongly margined, by the non-dentiform humeri, and by the more coarsely punctured mesosternum. The two following species belong to the same group, and may here be conveniently described, though they do not occur in the same zoological province.

27. APHODIUS SPARSUS, *n. sp.*

Elongate, subcylindrical, black, shining. Head finely punctulate, with a few small punctures intermixed; epistoma broadly emarginate in front, angles broadly rounded, sides oblique; genæ prominent, subacute. Prothorax more than twice as wide as long, narrower behind, sides strongly rounded, rather finely margined, obliquely truncate, but not sinuate behind; angles rounded, base bisinuate, finely margined; surface sparsely but strongly punctured, almost without punctures in front. Elytra with dentiform humeral angles, striæ fine, strongly punctured, interspaces flat and smooth. Mesosternum densely punctured, not carinate. Spinules of hind tibiæ unequal. Length 6.4^{mm} (0.25 inch).

Mariposa, Cal.; one specimen, given me by the late Mr. J. Thevenet, of Paris. This species is much less robust than *A. ovipennis;* the elytra are not narrowed near the base, and the punctures of the prothorax are less numerous.

28. APHODIUS HUMERALIS, *n. sp.*

More robust and convex, shining black. Head finely alutaceous, not punctulate; epistoma feebly but broadly emarginate in front, angles very much rounded, not obvious, sides oblique; genæ prominent, subacute. Prothorax very convex, sides feebly rounded and finely margined; hind angles obliquely and broadly emarginate (when looked at from above); marginal line of base punctured; surface with a few scattered large punctures, smooth in front. Elytra very convex, slightly narrowed near the base, humeri prominent, tuberculiform; striæ deep, marked with large distant punctures: interspaces somewhat convex, smooth. Mesosternum coarsely punctured, not carinate. Spinules of hind tibiæ (much worn, but apparently) unequal. Length 3.6^{mm} (0.14 inch).

Detroit, Mich.; one specimen, sent me by Messrs. Hubbard and Schwarz. This species is remarkable both for locality and characters, all of its allies, whether of this group or of group G, being found in the Central and Pacific districts.

BUPRESTIDÆ.

29. ANTHAXIA DELETA, *n. sp.*

Of the same form, color, and size as *A. viridifrons*, brown-bronze tinged with olive. Head (♂ bright green), finely reticulate, flat, perpendicularly declivous. Prothorax truncate before and behind, broadly rounded on the sides; very obsoletely, scarcely perceptibly reticulate, finely rugose, opake. Elytra distinctly granulate-punctate at the base, then finely but obviously punctured. Beneath black-bronzed, shining, antennæ and legs green. Length 4.6^{mm} (0.18 inch).

American Fork Cañon, Utah, (9,500 feet); only differs from *A. viridifrons* by the head and prothorax being more finely sculptured, while the elytra are more deeply sculptured.

30. CHRYSOBOTHRIS CARINIPENNIS, *n. sp.*

Dark gray, slightly bronzed. Head somewhat hairy, coarsely confluently punctured, with two small smooth calli. Prothorax very transverse, rounded on the sides, very coarsely punctured, with irregular, smooth, elevated cicatrices; an irregular rhomboidal dorsal space, limited by four of these cicatrices, is more finely punctured, and slightly carinate. Elytra with the depressed parts densely punctured: basal fossæ deep; the inner costa extends from the fossa to the tip, and is not sinuous; the 2d costa is irregular, less elevated just in front of the middle, and interrupted behind the middle; the 3d is short, as usual, occupying about the middle third of the length; the 4th arises in the margin behind the humerus and unites with the 2d near the tip; margin serrate from the middle to the tips, which are separately rounded. Beneath shining green-bronzed, sparsely punctured. Length 12.5$^{\mathrm{mm}}$ (0.5 inch).

♂ Head tinged with dull yellowish-green metallic lustre; 5th ventral segment strongly emarginate.

American Fork Cañon, Utah, (9,500 feet); allied to *C. dentipes*, but differs by the venation of the elytra, and by the much deeper emargination of the 5th ventral segment in the ♂; and also by the under surface being bright green. The middle and front tibiæ are not armed with teeth.

ELATERIDÆ.

31. CORYMBITES PLANULUS, *n. sp.*

Elongate, depressed, black, thinly clothed with fine, short, gray pubescence. Head punctured, front slightly concave. Prothorax longer than wide, rounded on the sides, narrowed in front of the middle; hind angles acute, divergent, finely carinate; disc densely and finely punctured, not convex except towards the sides; dorsal line wanting. Elytra not wider than the prothorax, disc flat, sides declivous, lateral margin broadly reflexed; striæ fine punctured, interspaces nearly flat, finely punctured. Antennæ longer than the head and prothorax, rather strongly serrate; 2d and 3d joints not dilated, together a little longer than the 4th; 3d one-half longer than the 2d. Antennæ, palpi, and legs brown or red-brown. Length 10$^{\mathrm{mm}}$ (0.40 inch).

Beaver Brook, Col., (6,000 feet); Northern New Mexico, Lieutenant Carpenter. Belongs to the same group as *C. triundulatus*, &c., but is very distinct by the dark color and more evidently punctured prothorax, as well as by the more depressed form of body.

LAMPYRIDÆ: subf. TELEPHORIDÆ.

32. PODABRUS BREVIPENNIS, *n. sp.*

Rather robust in form, black, thinly clothed with fine gray pubescence. Head as wide as the prothorax, densely finely punctured, eyes small, convex; mandibles and 1st joint of antennæ brown. Antennæ (♀) a little longer than the head and prothorax, rather stout, outer joints narrower, 3d a little longer than the 2d, but shorter than the 4th, prothorax one-half wider than long, sides straight and parallel, rounded only near the front angles, which are testaceous; hind angles rectangular, slightly prominent, base truncate; disk finely punctured with two large, shining, nearly smooth convexities, and well-marked dorsal line; side-margin reflexed. Elytra parallel, not wider than the prothorax, rather shining, densely rugose as usual, separately rounded at the tip. Last three dorsal segments of the abdomen exposed. (Palpi broken.) Claws with a small acute tooth beyond the middle. Length 87$^{\mathrm{mm}}$ (0.35 inch).

Argentine Pass, Col., (13,000 feet); one specimen. This species is quite distinct by the more robust form and shorter elytra.

MELYRIDÆ.

33. Melyris atra, *n. sp.*

Black, prothorax wider than long, narrowed in front, rounded and serrate on the sides, densely reticulated with shallow ocellate punctures. Elytra coarsely but densely punctured. Antennæ black, 2d and 3d joints piceous. Legs piceous. Length 5$^{\mathrm{mm}}$ (0.20 inch).

♂ unknown; ♀ elytra with a large smooth spot near the tip; antennæ, 1st and 2d joints large and thick; 3d slender, longer than the 2d; 4th and 5th triangular; 6th to 9th transverse; 10th oval.

Beaver Brook, Col., (6,000 feet); one specimen. I can see but ten joints in the antennæ; the legs are dark-colored, but otherwise this species is very closely allied to the next.

34. Melyris flavipes, *n. sp.*

Black, with a blue reflection; form and sculpture as in *M. atra*, but smaller; antennæ piceous towards the base. Legs bright reddish-yellow. Length 3.3$^{\mathrm{mm}}$ (0.13 inch).

♂ elytra uniformly punctured toward the tip. Antennæ black, 11-jointed; 3d joint as long as the 2d, triangular; 4th triangular, shorter; 5th and 6th transverse, not longer, but wider, and acute at the inner side; 7th to 10th transverse, still wider; 11th oval.

♀ elytra each with a smooth spot near the tip. Antennæ 10-jointed, piceous at base, 3d and 4th joints slender, closely united, together longer than the 2d; 5th and 6th acutely triangular; 7th, 8th, 9th, and 10th wider; 11th oval.

California; one pair; locality unknown.

35. Callidium janthinum.

Specimens collected in the Rocky Mountains do not differ essentially from Canadian individuals of this well-known species. There are, however, allied races from Texas, California, and Idaho, of which I do not possess sufficiently large series to enable me to define them with precision. Careful observations of the habits, food-trees, and structural differences of the blue *Callidia* of this continent are much needed. The comparison of our species, when properly investigated, with those of the Palæarctic region promises well for the investigation of possible changes produced by differences in food and locality.

36. Crossidius Allgewahri, *n. sp.*

Piceous without lustre, very densely clothed with dirty-yellow hair. Prothorax rounded on the sides, feebly or not at all tuberculate; punctures dense, concealed by the hair. Elytra densely and finely, but not distinctly punctured, rounded at the tip; sides broadly testaceous, blending imperceptibly with the dark color. Beneath testaceous, very hairy, antennæ and legs black. Length 10–13.3^{mm} (0.40–0.53 inch).

Atlanta, Idaho, (7,800 feet); collected by Mr. L. Allgewahr, to whom I dedicate it, as a mark of his worthy appreciation of the importance of scientific investigation. The specimens were kindly given me by Mr. Reinecke, of Buffalo, N. Y.

This species is more nearly related to *C. humeralis* than to the others, but differs from it, as from all, by the very finely punctured elytra.

In the smaller specimen, there is a faint and perhaps illusive appearance of a lateral prothoracic tubercle, which is produced mainly by the projection of hairs.

37. XYLOTRECHUS UNDULATUS, *var.?*

A form occurs which differs from the usual Northern specimens of this species by the markings being narrow and imperfect, and the sculpture of the elytra more distinct. It is not uncommon in the Rocky Mountain region, and was found by Mr. Bowditch at Florissant (8,000 feet).

38. NEOCLYTUS ASCENDENS, *n. sp.*

Very elongate, similar in form and sculpture to *N. leucozonus*. It differs by the prothorax being less muricate along the dorsal line, and more distinctly and coarsely punctured towards the sides. Elytra very finely granulato-punctate, base, short sutural line from the base for one-fourth the length white pubescent; this line diverges from the suture and then ends; there is also an oblique fascia just behind the middle, which runs backwards from the suture and nearly attains the sides of the elytra: it is connected at its outer end with a submarginal gray stripe, which ascends forwards to within one-fifth from the base; another posterior band, with oblique anterior margin, occupies the apical one-sixth of the elytra; tips rounded. Antennæ slender, more than half the length of the body. Posterior femora extending to the tip of the elytra. Length 8.5^{mm} (0.34 inch).

Leavenworth Valley, above Georgetown, Colo., (9,000 to 10,000 feet); one specimen.

CHRYSOMELIDÆ.

39. GLYPTOSCELIS LONGIOR, *n. sp.*

Subcylindrical, narrower than *G. albida*, bronze color, clothed with white hair (which is mostly rubbed off in the specimen). Head densely punctured. Prothorax a little wider than long, slightly narrowed in front, hind angles acute, prominent laterally; disc less coarsely punctured than in *G. albidus*, obliquely impressed each side near the hind angles. Elytra punctured as in that species. Length 5.5^{mm} (0.225 inch).

One ♀. Atlanta, Idaho; Mr. O. Reinecke. Easily distinguished from *G. albidus* by the narrower form and longer prothorax.

40. **Chrysomela montivagans**, *n. sp.*

Apterous, oval convex, bluish or black, slightly bronzed, moderately shining. Prothorax sparsely but not coarsely punctured, longitudinally sulcate and coarsely punctured each side, margin strongly incrassed, sides rounded. Elytra sparsely punctured. Length 6.7^{mm} (0.27 inch).

Mount Lincoln (11,000 to 13,000 feet); found also by Prof. F. H. Snow. This species is closely allied to *C. auripennis* Say, and resembles the dark varieties; it differs by the sides of the prothorax being regularly and rather strongly rounded, by the wings being undeveloped, and by the elytra being much less coarsely punctured.

CURCULIONIDÆ.

41. **Magdalis alutacea**, *n. sp.*

Elongate cuneiform, black, slightly bronzed, opake with a silky lustre. Beak slender, curved, as long as the head and prothorax, finely punctured. Head feebly punctulate. Prothorax a little longer than wide, narrowed in front, sides not serrate, broadly rounded, then slightly sinuate; hind angles acute, divergent; surface very densely, but not coarsely, punctured. Elytra, with striæ composed of small, quadrate, approximate punctures, interspaces flat, finely alutaceous. Femora acutely toothed; claws entire, not toothed. Length 42^{mm} (0.17 inch).

Leavenworth Valley, above Georgetown, Colo., (9,000 to 10,000 feet); Isle Royale, Lake Superior, Mr. E. A. Schwarz. This species differs from *M. imbellis* by finer sculpture, less rounded sides of the prothorax, and black color; from *M. gentilis* LeC. by the divergent hind angles of the prothorax, by the less convex and less deeply striate elytra; the interspaces are wider, and not rugose, but alutaceous.

LIST OF COLEOPTERA COLLECTED BY MR. F. C. BOWDITCH IN THE ROCKY MOUNTAINS AT AN ELEVATION OF 6,000 FEET AND UPWARDS.

CICINDELIDÆ.		
Cicindela longilabris	10-11,000	Argentine Pass, Colo.
race *montana*	9,500	American Fork Cañon, Utah.
splendida?	8-10,000	South Park, Colo.
purpurea race *Audubonii*	8-10,000	Do.
12-*guttata* races *oregona* and *guttifera*	8-10,000	Do.
CARABIDÆ.		
Omophron ovale	6- 7,000	Green River City, Wyo.
Elaphrus riparius	6- 7,000	Do.
Loricera semipunctata	8-10,000	South Park, Colo.
Trachypachys inermis	13,000	Argentine Pass, Colo.
Notiophilus Hardyi	13,000	Do.
Opisthius Richardsonii	6- 7,000	Green River City, Wyo.
Nebria trifaria, n. sp	9,500	American Fork Cañon.
purpurata, n. sp	9-10,000	Leavenworth Valley, above Georgetown, Colo.
longula, n. sp	(?)	(?)
obliqua Lec	(?)	(?)
obtusa, n. sp	6- 7,000	North Fork of South Platte.
Sahlbergi	(?)	(?)
Carabus taedatus, very small variety	13,000	Argentine Pass, Colo.
Cymindis cribricollis (*marginata* Kirby, *reflexa* Lec.).	8-13,000	Everywhere.
abstrusa (*marginata* Chand., *cribricollis* Lec., *brevipennis* Zimm.).	8-10,000	Many localities.
unicolor Kirby, *hudsonica* Lec	9-13,000	Do.
Philophuga Hornii Chand	8,000	Florissant, Colo.
Calathus ingratus	8-13,000	Several localities.
dubius	8,000	Florissant, Colo.
Platynus errans	8-10,000	South Park.
subcordatus	8-10,000	Do.
placidus	8,000	Several localities.
cupripennis	8-10,000	South Park.
chalceus	8-10,000	Do.
Pterostichus longulus	9-10,000	Leavenworth Valley, above Georgetown, Colo.
orninomum	9-10,000	Leavenworth Valley, &c.
Luczotii	8-10,000	South Park, Colo, &c.
surgens, n. sp	9-13,000	Alma; Argentine Pass, Colo.
Amara avida	7- 8,000	North Fork of South Platte Cañon.
cylindrica, n. sp	8-10,000	South Park, Colo.
hyperborea	14,000	Locality unknown.
brunnipennis	10-11,000	Argentine Pass; Mount Lincoln; only found above timber line.
subpunctata	8-10,000	Florissant; South Park; Leavenworth Valley, Colo.
fallax	8,000	Florissant, Colo.

List of Coleoptera—Continued.

CARABIDÆ.		
Amara erratica	8-10,000	Alma; South Park.
interstitialis	8-10,000	South Park, &c.
gibba	8-13,000	Everywhere.
chalcea	8-10,000	Do.
obesa	8-10,000	Do.
Chlaenius sericeus	6- 7,000	Green River City, Wyo.
Cratacanthus dubius	8,000	Garland, Colo.
Harpalus retractus	8,000	Do.
amputatus	8-10,000	Everywhere.
fallax?	7- 8,000	Do.
herbivagus	8-10,000	Alma; South Park.
ventralis	8,000	Garland, Colo.
ellipsis	8,000	Do.
Harpalus fraternus	9-11,000	Leavenworth Valley.
funestus	8-10,000	Leavenworth Valley; Garland, Colo.
oblitus	7- 8,000	North Fork of South Platte Cañon.
ochropus	8-10,000	South Park, Colo.
basilaris	8-10,000	Do.
clandestinus, n. sp	8,000	Garland, Colo.
Stenolophus conjunctus	8,000	Florissant, Colo.
Patrobus aterrimus	6- 8,000	Green River City, Wyo.
Bembidium Lorquinii	6- 7,000	Do.
Bowditchii, n. sp	6- 7,000	Do.
bifossulatum	6- 7,000	Do.
antiquum	6- 7,000	Do.
recticolle	6- 7,000	Do.
longulum	6- 7,000	Do.
planatum	6- 7,000	Do.
planiusculum	9,500	American Fork Cañon, Utah; Leavenworth Valley.
tetraglyptum	9-10,000	Leavenworth Valley; Alma.
maeklini	9,500	American Fork Cañon, Utah.
nebraskense	6- 7,000	Green River City, Wyo.
transversale	6- 9,500	Green River City, Wyo; American Fork Cañon.
bimaculatum	8-10,000	South Park.
lucidum	8,000	Garland; Florissant.
race *substriatum*	8,000	Garland.
rupestre	8,000	Florissant.
mixtum	6- 9,500	Green River City, Wyo.; Florissant; American Fork Cañon.
gelidum	8,000	Garland, Colo.
obtusangulum	8-10,000	South Park, Colo.
cordatum	6- 7,000	Green River City, Wyo.
nigripes	8,000	Florissant, Colo.
patruele	9-10,000	Leavenworth Valley.
rapidum	8-10,000	South Park, Colo.
pictum	6- 7,000	Green River City, Wyo.
Scudderi, n. sp	4,300	Salt Lake Valley.
axillare	9,500	American Fork Cañon.

List of Coleoptera—Continued.

DYTISCIDÆ.		
Hydroporus congruus, n. sp	8,000	Florissant, Colo.
nubilus	8,000	Do.
striatellus	8,000	Do.
puberulus	10–11,000	Leavenworth Valley.
one undetermined	10–11,000	Do.
Rhantus binotatus	8,000	Florissant, Colo.
Gaurodytes obliteratus	10–11,000	Leavenworth Valley.
Austinii	8,000	Florissant, Colo.
nanus, n. sp	8,000	Do.
intersectus	6,300	Manitou, Colo.
Anisomera cordata	6,300	Do.
HYDROPHILIDÆ.		
Helophorus nitidulus	10–11,000	Leavenworth Valley.
Laccobius agilis	8,000	Florissant, Colo.
Philhydrus perplexus	8,000	Garland, Colo.
STAPHYLINIDÆ.		
Philonthus near *inquietus*	10,000	Alma, Colo.
Geodromicus ovipennis, n. sp	10–11,000	Leavenworth Valley.
Orobanus simulator, n. sp	10–11,000	Do.
SILPHIDÆ.		
Necrophorus Melsheimeri	9,500	American Fork Cañon, Utah.
Silpha ramosa	6–10,000	South Park.
lapponica	8,000	Florissant, Colo.
DERMESTIDÆ.		
Anthrenus scrophulariæ var. *lepidus* Lec	6,000	Beaver Brook, Colo.
CUCUJIDÆ.		
Catogenus rufus	8– 9,500	American Fork Cañon, Utah.
TROGOSITIDÆ.		
Trogosita virescens	9,000	American Fork Cañon, Utah.
COCCINELLIDÆ.		
Hippodamia 5-signata	6–10,000	Everywhere.
Coccinella 9-notata	6– 7,000	Green River City, Wyo.
monticola	8,000	Garland, Colo.
Brachiacantha ursina, var	6,000	Beaver Brook, Colo.
Scymnus nigripennis, n. sp	8,000	Florissant, Colo.

List of Coleoptera—Continued.

BYRRHIDÆ.		
Byrrhus, one species	....	(Not determined.)
PARNIDÆ.		
Helichus striatus	6,300	Manitou, Colo.
HISTERIDÆ.		
Saprinus oregonensis	6- 7,000	Green River City, Wyo.
plenus	9,500	American Fork Cañon, Utah.
fimbriatus	8,000	Garland, Colo.
SCARABÆIDÆ.		
Canthon praticola	9,500	American Fork Cañon, Utah.
Aphodius ursinus	10,000	Alma.
aleutus	10-11,000	Leavenworth Valley.
congregatus	10-11,000	Do.
terminalis	10-13,000	Argentine Pass; Mount Lincoln.
vittatus	6- 7,000	Grand River City, Utah; Argentine Pass.
anthracinus, n. sp	9,500	American Fork Cañon, Utah.
Trox sonoræ	8,000	Florissant, Colo.
Cremastochilus crinitus, Lec	9,500	American Fork Cañon, Utah.
BUPRESTIDÆ.		
Buprestis Nuttalli	8,000	Florissant, Colo.
maculiventris	8-10,000	Everywhere.
rusticorum	8-10,000	Do.
Melanophila Drummondi	9,500	American Fork Cañon, Utah.
Anthaxia deleta, n. sp	9,500	Do.
Chrysobothris dentipes	8,000	Florissant, Colo.
carinipennis, n. sp	9,500	American Fork Cañon, Utah.
trinervia	8-10,000	Leavenworth Valley.
ELATERIDÆ.		
Cardiophorus convexulus	9,500	American Fork Cañon, Utah.
Cryptohypnus funebris	9,500	Do.
bicolor	9-10,000	Alma; Leavenworth Valley.
Elater phœnicopterus	9-10,000	Leavenworth Valley.
Athous ferruginosus	9-10,000	Do.
Corymbites planulus, n. sp	6,000	Beaver Brook, Colo.
Asaphes coracinus	6- 7,000	Green River City.
LAMPYRIDÆ, subfam. TELEPHORIDÆ.		
Chauliognathus basalis	8,000	Garland, Colo.
Podabrus lateralis	9-13,000	Argentine Pass; Leavenworth Valley.
brevipennis, n. sp	13,000	Argentine Pass.

List of Coleoptera—Continued.

DYTISCIDÆ.		
Hydroporus congruus, n. sp	8,000	Florissant, Colo.
nubilus	8,000	Do.
striatellus	8,000	Do.
puberulus	10-11,000	Leavenworth Valley.
one undetermined	10-11,000	Do.
Rhantus binotatus	8,000	Florissant, Colo.
Gaurodytes obliteratus	10-11,000	Leavenworth Valley.
Austinii	8,000	Florissant, Colo.
nanus, n. sp	8,000	Do.
intersectus	6,300	Manitou, Colo.
Anisomera cordata	6,300	Do.
HYDROPHILIDÆ.		
Helophorus nitidulus	10-11,000	Leavenworth Valley.
Laccobius agilis	8,000	Florissant, Colo.
Philhydrus perplexus	8,000	Garland, Colo.
STAPHYLINIDÆ.		
Philonthus near *inquietus*	10,000	Alma, Colo.
Geodromicus ovipennis, n. sp	10-11,000	Leavenworth Valley.
Orobanus simulator, n. sp	10-11,000	Do.
SILPHIDÆ.		
Necrophorus Melsheimeri	9,500	American Fork Cañon, Utah.
Silpha ramosa	8-10,000	South Park.
lapponica	8,000	Florissant, Colo.
DERMESTIDÆ.		
Anthrenus scrophulariæ var. *lepidus* Lec	6,000	Beaver Brook, Colo.
CUCUJIDÆ.		
Catogenus rufus	8- 9,500	American Fork Cañon, Utah.
TROGOSITIDÆ.		
Trogosita virescens	9,000	American Fork Cañon, Utah.
COCCINELLIDÆ.		
Hippodamia 5-signata	6-10,000	Everywhere.
Coccinella 9-*notata*	6- 7,000	Green River City, Wyo.
monticola	8,000	Garland, Colo.
Brachiacantha ursina, var	6,000	Beaver Brook, Colo.
Scymnus nigripennis, n. sp	8,000	Florissant, Colo.

List of Coleoptera—Continued.

BYRRHIDÆ.		
Byrrhus, one species	....	(Not determined.)
PARNIDÆ.		
Helichus striatus	6,300	Manitou, Colo.
HISTERIDÆ.		
Saprinus oregonensis	6– 7,000	Green River City, Wyo.
plenus	9,500	American Fork Cañon, Utah.
fimbriatus	8,000	Garland, Colo.
SCARABÆIDÆ.		
Canthon praticola	9,500	American Fork Cañon, Utah.
Aphodius ursinus	10,000	Alma.
aleutus	10–11,000	Leavenworth Valley.
congregatus	10–11,000	Do.
terminalis	10–13,000	Argentine Pass; Mount Lincoln.
vittatus	6– 7,000	Grand River City, Utah; Argentine Pass.
anthracinus, n. sp	9,500	American Fork Cañon, Utah.
Trox sonoræ	8,000	Florissant, Colo.
Cremastochilus crinitus, Lec	9,500	American Fork Cañon, Utah.
BUPRESTIDÆ.		
Buprestis Nuttalli	8,000	Florissant, Colo.
maculiventris	8–10,000	Everywhere.
rusticorum	8–10,000	Do.
Melanophila Drummondi	9,500	American Fork Cañon, Utah.
Anthaxia deleta, n. sp	9,500	Do.
Chrysobothris dentipes	8,000	Florissant, Colo.
carinipennis, n. sp	9,500	American Fork Cañon, Utah.
trinervia	8–10,000	Leavenworth Valley.
ELATERIDÆ.		
Cardiophorus convexulus	9,500	American Fork Cañon, Utah.
Cryptohypnus funebris	9,500	Do.
bicolor	9–10,000	Alma; Leavenworth Valley.
Elater phœnicopterus	9–10,000	Leavenworth Valley.
Athous ferruginosus	9–10,000	Do.
Corymbites planulus, n. sp	6,000	Beaver Brook, Colo.
Asaphes coracinus	6– 7,000	Green River City.
LAMPYRIDÆ, subfam. TELEPHORIDÆ.		
Chauliognathus basalis	8,000	Garland, Colo.
Podabrus lateralis	9–13,000	Argentine Pass; Leavenworth Valley.
brevipennis, n. sp	13,000	Argentine Pass.

List of Coleoptera—Continued.

	MALACHIDÆ.	
Collops hirtellus, Lec	11–13,000	Mount Lincoln; Pike's Peak.
Melyris atra, n. sp	6,000	Beaver Brook, Colo.
	CLERIDÆ.	
Clerus sphegeus	6,000	Beaver Brook, Colo.
moestus	8,000	Florissant, Colo.
nigriventris	8,000	Do.
Hydnocera subfasciata	10–13,000	Mount Lincoln.
Corynetes violaceus	8,000	Florissant, Colo.
	CERAMBYCIDÆ.	
Criocephalus asper	6– 7,000	Green River City, Wyo.
Tetropium cinnamopterum	9–10,000	Leavenworth Valley.
Callidium janthinum	9–10,000	Do.
Crossidius pulchellus	8,000	Garland, Colo.
discoideus	8,000	Do.
Xylotrechus mormonum	9,500	American Fork Cañon, Utah.
undulatus, var. ?	8,000	Florissant, Colo.
Neoclytus muricatulus	9–10,000	Leavenworth Valley.
ascendens, n. sp	9–10,000	Do.
Acmæops atra	11–13,000	Mount Lincoln.
longicornis	9–10,000	Leavenworth Valley.
ligata	9–10,000	Do.
gibbula	9–10,000	Do.
pratensis	9–10,000	Do.
Typocerus balteatus Horn	8,000	Garland, Colo.
Leptura propinqua	9–10,000	Leavenworth Valley.
similis	9–10,000	Do.
canadensis, race *cribripennis*	7– 8,000	North Fork of South Platte Cañon.
chrysocoma	9–10,000	Leavenworth Valley.
	CHRYSOMELIDÆ.	
Orsodacna childreni	9–10,000	Leavenworth Valley.
Saxinis saucia	6– 7,000	Green River City, Wyo.
Coscinoptera vittigera	6– 7,000	Do.
Pachybrachys (2 species)	6– 7,000	Do.
Heteraspis marcassita ?	6– 7,000	Do.
Chrysomela montivagans, n. sp	11–13,000	Mount Lincoln.
Entomoscelis adonidis	8–13,000	Everywhere.
Plagiodera prasinella	8,000	Florissant, Colo.
oviformis	8,000	Do.
Adimonia externa	11–13,000	Mount Lincoln.
Trirhabda canadensis	8,000	Garland, Colo.
n. sp. ?	8–10,000	South Park, Colo.
Graptodera bimarginata	6– 7,000	Green River City, Wyo.
foliacea	8,000	Florissant, Colo.
Orchestris Lewisii	6– 7,000	Green River City, Wyo.

List of Coleoptera—Continued.

TENEBRIONIDÆ.

Asida elata	8-10,000	South Park.
Coniontis obesa	8,000	Garland, Colo.
Eleodes humeralis	8-10,000	South Park.
extricata	8,000	Various localities.
nigrina	8,000	Garland; Florissant, Colo.
pimelioides	9,500	American Fork Cañon, Utah.
Blapstinus pratensis	8-10,000	Various localities.
Cœlocnemis dilaticollis	7- 8,000	North Fork of South Platte Cañon.
Iphthimus serratus, var	7- 8,000	Do.
Helops difficilis Horn	6- 7,000	Green River City, Wyo.

MORDELLIDÆ.

Anaspis nigra	6,000	Beaver Brook, Colo.
rufa	6- 7,000	Green River City; Beaver Brook.

MELOIDÆ.

Meloe strigulosus	8,000	Florissant, Colo.
Epicauta pruinosa	10-13,000	Mount Lincoln.
maculata	6- 7,000	Green River City, Wyo.
Cantharis compressicornis	10,000	Alma, Colo.

ANTHICIDÆ.

Stereopalpus guttatus	6- 7,000	Green River City, Wyo.
Corphyra Lewisii	6,000	Beaver Brook, Colo.

RHYNCHITIDÆ.

Rhynchites bicolor	6- 7,000	Green River City, Wyo.

CURCULIONIDÆ.

Minyomerus innocuus	8-10,000	South Park; Florissant.
Peritaxia hirsuta	8,000	Garland, Colo.
Trichalophus planirostris	8-10,000	South Park.
Macrops (not determined)	8-10,000	Do.
Lepyrus gemellus	13,000	Argentine Pass.
Stephanocleonus cristatus	8,000	Florissant, Colo.
Magdalis imbellis	10-11,000	Leavenworth Valley.
alutacea, n. sp	10-11,000	Do.

SCOLYTIDÆ.

Tomicus rectus	9-10,000	Leavenworth Valley.
hudsonicus	10-11,000	Do.
interruptus	10-11,000	Do.
Dryocoetes affaber	10-11,000	Do.
Dendroctonus similis	10-11,000	Do.
rufipennis	10-11,000	Do.

List of Coleoptera collected at Atlanta, Idaho—Continued.

Saprinus lugens.
fimbriatus.
Canthon simplex.
Aphodius ochreipennis.
phæopterus, *n. sp.*
Trox atrox.
Dichelonycha valida.
Diplotaxis brevicollis.
subangulata.
Listrochelus sociatus *Horn.*
Polyphylla 10-lineata.
Cotalpa granicollis.
Ligyrus gibbosus.
Chalcophora angulicollis.
Dicerca sexualis.
Buprestis Gibbsii.
lauta.
apricans.
Dicerca prolongata.
Melanophila appendiculata.
Drummondi.
gentilis.
Adelocera profusa.
Cardiophorus longior.
Megapenthes aterrimus.
Elater cordifer.
Dolopius lateralis.
Melanotus oregonensis.
Athous ferruginosus.
Corymbites carbo.
Podabrus pruinosus.
n. sp.
Pristoscelis antennatus.
Listrus canescens.
Trichodes ornatus.
Clerus sphegeus.
Corynetes violaceus.
Anobium quadrulum.
Spondylis upiformis.
Prionus californicus.
Homoæsthesis integra.
Tragosoma Harrisii.
Asemum atrum.
Criocephalus asperatus.
Phymatodes dimidiatus.
Callidium cicatricosum.
Xylocrius Agassizii, *? var.*
Crossidius Allgewahri.
Stenocorus lineatus.
Pachyta liturata.
Anthophylax mirificus.
Acmæops atra.
militaris.
Leptura obliterata.
Leptura propinqua.
plagifera.
canadensis.
chrysocoma.
nigrolineata.
Monohammus clamator.
Tetraopes discoideus.
Cryptocephalus 4-maculatus.
Glyptoscelis longior, *n. sp.*
Chrysochus cobaltinus.
Chrysomela clivicollis.
sigmoidea.
Plagiodera confluens.
Monoxia debilis.
Disonycha punctigera.
Graptodera, *not determined.*
Eurymetopon serratum.
Eusattus muricatus.
Coniontis ovata.
Eleodes caudifera.
hispilabris.
extricata.
tenebrosa.
parvicollis.
pimelioides.
Iphthimus serratus.
Cœlocnemis dilaticollis.
punctata.
Alæphus, *n. sp. ?*
Blapstinus pratensis.
Helops californicus.
convexulus.
Xylita lævigata.
Symphora rugosa.
Mordellistena unicolor.
Meloe, *sp.*
Tricrania Stansburii.
Epicauta sericans.
Wheeleri.
Cantharis cyanipennis.
fulgifera.
Cephaloon lepturides.
Calopus angustus.
Crymodes discicollis.
Rhynchites bicolor.
Minyomerus languidus.
Ophryastes sulcirostris.
Centrocleonus angularis.
Cleonus sparsus.
Polygraphus rufipennis.
Tomicus rectus.
Dendroctonus valens.
Hylastes macer.
gracilis.

APPENDIX II.

THE NORTH AMERICAN SPECIES OF NEBRIA.

Among the *Coleoptera* collected by Mr. Bowditch, I found three undescribed species of *Nebria;* two others were previously in my cabinet, and these added to those already described increase the present number[*] of North American species to twenty-two.

Now the genus *Nebria*, with a few exceptional species, is restricted to very northern regions or to high altitudes. It therefore possesses peculiar fitness for indicating, by the relation of its numerous species, the migrations, on the one hand, by which they have assumed their present distribution, and the modifications in structure, on the other hand, by which the descent of several species from an original stock may be manifested.

I have consequently availed myself of the present opportunity to review the species in my collection, and have endeavored to separate them into minor groups, in such way as to exhibit the closer resemblances of the various forms which seem most nearly allied.

For the rapid determination of species, the grouping here given will be found less useful than the excellent table published by Dr. Horn in Transactions of the American Entomological Society, 1870, iii, 98; but the object of the two studies is different. Dr. Horn's was intended as an analytical table of differences, to facilitate the recognition of species; mine is for the purpose of bringing out more clearly the resemblances.

The relations of the new species here described with those mentioned by Dr. Horn may be expressed in the following additions to his table:—

* * * * * * *

Side-margin of prothorax very narrow .... *ingens* Horn.
Side-margin of prothorax wider .... *ovipennis*, n. sp.

* * * * * * *

Elytra purple, 3d, 5th, and 7th interspaces with two or three punctures, *purpurata*, n. sp.
Piceous-black, 3d stria with five or six small punctures .. *gregaria* Esch.

* * * * * * *

Antennæ and legs yellow-brown .... *obtusa*, n. sp.
Antennæ and legs black:
  Elytra rather broad, parallel on the sides, 3d stria with one dorsal puncture .... *obliqua* Lec.
  Elytra narrower, with several dorsal punctures on the 3d interspace:
    Elytra obovate, wider behind, striæ fine .... *longula*, n. sp.
    Elytra parallel, striæ deeper .... *suturalis* Lec.

* * * * * * *

Interspaces 3d, 5th, and 7th interrupted with large punctures .. *trifaria*, n. sp.
Interspaces 3d and 7th with a few small punctures ...... *Rathvoni* Lec.

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[*] Two Motschulskian indeterminates, *N. elias* and *mollis*, are omitted.

But in order to exhibit the resemblances of the species to each other, a different grouping is necessary. In preparing a suitable one, I have used as a primary character the number of ambulatorial setæ, which arise from punctures on the ventral segments of the abdomen.

These punctures are arranged in a row each side of the median line, running backwards from the hind trochanters, as in other *Carabidæ;* in nearly all the species, these rows are formed by two or three approximate punctures arranged transversely on each segment; but in *N. virescens* and *pallipes* the rows are reduced to single punctures on each segment. The further division of the species into groups may then proceed by the form of the elytra and the width of the side-margin of the prothorax, as in the following table. The form and sculpture of the prolonged posterior extremity of the prosternum will also be found useful for separating the species in each group.

TABLE OF GROUPS OF SPECIES.

Rows of ambulatorial setæ double..............................2.
Rows of ambulatorial setæ single..............................3.
2. Elytra oval, without humeri; episterna of metathorax not longer than wide, Sp. 1—3..............................I.
Elytra elongate-oval, with indistinct rounded humeri; episterna of metathorax more than one-half longer than wide, Sp. 4—7.....II.
Elytra oval, with indistinct rounded humeri; episterna of metathorax more than one-half longer than wide; prothoracic side-margin narrow, Sp. 8—9..............................III.
Elytra more or less truncate at base; humeri distinct; prothoracic side-margin wide, Sp. 10—21..............................IV.
3. Prothorax moderately narrowed behind, Sp. 22..................V.
Prothorax very much narrowed behind, Sp. 23....................VI.

GROUP I:—*ingens.*

In this group, the episterna are short, scarcely longer than wide. The elytra are oval, or elongate-oval, oblique and rounded at base, without trace of humeral angles. The wings are entirely wanting, or undeveloped. The prosternum varies in form, according to species. The side-margin of the prothorax is narrow in *N. diversa* and *ingens*, but wider in *ovipennis.* The rows of ambulatorial setæ of the abdomen are double.

Three species are known to me, inhabiting the high mountains of the Pacific slope:—

Prosternum flattened at tip and margined; side-margin of prothorax extremely fine; color pale brown..........................1. *diversa.*
Prosternum prolonged, lanceolate at tip, margined at the sides, but not at the extreme tip; side-margin of prothorax very fine; color black..............................2. *ingens.*
Prosternum flattened at tip, slightly declivous, and not margined; side-margin of prothorax wider; color black............3. *ovipennis*, n. sp.

GROUP II:—*trifaria.*

The episterna of the metathorax are more than one-half longer than wide. The elytra are elongate-oval, and the humeri are rounded and indistinct, without humeral angle. The outline differs according to species, as will be seen by the table. The prosternum also varies in form. The prothoracic side-margin is wide in *trifaria* and *Rathvonii*, but narrower in *purpurata* and *carbonaria.* In the last-named, the hind angles of the prothorax are obtuse, and the dorsal punctures are only on the 2d interspace; in the other three, the sides of the prothorax are strongly sinuate, and the hind angles are rectangular and prominent. There are also punctures on the 3d, 5th, and 7th interspaces, or on the 3d and 7th.

Two species inhabit the Alpine Rocky Mountains, one the Sierra Nevada of California, and one Kamtschatka and the islands of Alaska:—

Hind angles of prothorax prominent rectangular....................2.

Hind angles of prothorax obtuse; 3d interspace of elytra with four or five punctures behind the middle; prosternum flattened at tip, finely margined; color black, antennæ and legs dark brown; much smaller than the others of this group......................7. *carbonaria.*

2. Elytra elongate-oval, slightly wider behind, purple, 3d, 5th, and 7th with a few punctures behind the middle; prosternum lanceolate at tip, not margined; prothoracic side-margin narrow.. 4. *purpurata*, n. sp.

Elytra oval, less elongate, 3d, 5th, and 7th interspaces interrupted by large punctures; prosternum margined; side-margin of prothorax broad; color black...........................5. *trifaria*, n. sp.

Elytra oval, less rounded at the base, 3d and 7th interspaces interrupted by smaller punctures; 5th without punctures; prosternum not margined at tip; side-margin of prothorax wide; color black. 6. *Rathvoni.*

GROUP III:—*Mannerheimii.*

The species of this group are wider and flatter than those of the preceding, and the elytra are less rounded at base, so that the humeri are indistinct, but not wanting; the basal fold is slightly bent, and makes a feeble angle with the side-margin, but by no means so obvious as in the following group, and the sides are not parallel, but rounded. The prosternum is flattened at tip and margined, and the side-margin of the prothorax is obviously narrower than in the following groups; the sides are but feebly sinuate towards the base, and the hind angles, though rectangular, are small and not prominent. There are four or five small dorsal punctures on the 3d stria or adjacent to it.

Antennæ and legs black...........................8. *Mannerheimii.*

Antennæ and legs testaceous ....9. *Eschscholtzii.*

GROUP IV.

The species of this group are more numerous than those of the other groups united, and may be readily known by the basal fold of the elytra making a distinct angle with the side-margin. The elytra are truncate at base, with rounded humeri; the sides are then parallel for two-thirds the length; the dorsal punctures are on the 3d, or on the 3d, 5th, and 7th interspaces. The tip of the prosternum is margined in most of the species, but not margined in *N. metallica.*

The side-margins of the prothorax are strongly reflexed, and the sides strongly sinuate near the base; the angles are rectangular and prominent in most species, but obtuse in others.

A. Hind angles of prothorax obtuse; dorsal punctures on 3d interspace:
  Body more elongate..2.
  Body broader and flatter....................................3.
    2. Hind angles of prothorax almost rounded.....10. *suturalis.*
      Hind angles of prothorax distinctly defined...11. *longula*, n. sp.
    3. Antennæ and legs black......................12. *obliqua.*
      Antennæ and legs ferruginous.................13. *obtusa*, n. sp.
B. Hind angles of prothorax rectangular; dorsal punctures on 3d interspace:
  Sides of prothorax suddenly and strongly sinuate behind.........2.
  Sides of prothorax more gradually and obliquely sinuate behind; color black....................................14. *hudsonica.*
    2. Antennæ and legs black; color black............15. *Sahlbergi.*
      Antennæ and legs ferruginous; color piceous-black...16. *nivalis.*
      Smaller, antennæ and legs brown; elytra metallic, with large dorsal punctures................................17. *viridis.*
  Much more elongate; elytra slightly metallic; dorsal punctures small......................................18. *gregaria.*
C. Hind angles of prothorax rectangular; elytra with two or three rows of dorsal punctures:
  More slender, elytra violet, somewhat coppery, striæ fine, dorsal punctures on 3d and 7th interspaces..............19. *Gebleri.*
  Broader, elytra more strongly metallic; striæ deeper, 3d, 5th, and 7th interspaces interrupted by larger punctures; prosternum not margined at tip..........................20. *metallica.*
  Black, antennæ and legs dark brown; elytral striæ deep; 3d and 5th interspaces interrupted by large punctures........21. *bifaria.*

GROUP V:—*virescens.*

A single species, of robust form, with slight greenish-metallic lustre, constitutes this group. The prothorax is broad, less narrowed behind than usual, the sides not sinuate, margin widely reflexed, and basal angles obtuse. The elytra are subtruncate at base; the basal fold meets the side-margin in a distinct angle; the sides are slightly rounded, the striæ very fine, obliterated at the sides and tip; the dorsal punctures are small; the posterior one is on the 2d, the other three on the 3d stria. The prosternum is not margined at tip; the setigerous punctures of the ventral segments are in a single row each side of the middle.

22. *N. virescens* occurs in Vancouver Island and Northern California.

GROUP VI:—*pallipes.*

The color is black, with the antennæ, palpi, and legs yellow-testaceous. Prothorax strongly narrowed behind, basal angles obtuse, side-margin widely reflexed. Elytra subtruncate at base, basal fold meeting the side-margin in a distinct angle: humeri rounded, sides slightly rounded; striæ deep, less impressed at the sides and tip; dorsal punctures four or five, situated on the 3d stria. Prosternum flattened at tip, and strongly margined; setigerous punctures of ventral segments in a single row each side.

23. *N. pallipes* is found on the Atlantic slope near streams, in hilly or mountainous regions, from Nova Scotia to Minnesota, and southward to Virginia. Three well-marked races are known to me:—

1. Elytra distinctly subtruncate at base; striæ deep; wings well developed:—this is the usual form.
2. Elytra distinctly subtruncate at base; striæ less deep, obliterated at sides and tip; wings well developed. Minnesota.
3. Elytra more rounded at base, narrower and more convex; striæ deep, obliterated at sides and tip; wings wanting. Nova Scotia.

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3. N. OVIPENNIS, *n. sp.*

Apterous, shining brownish black; head with the eyes narrower than the prothorax; frontal impressions obsolete; antennæ extending to about one-fourth the length of the elytra. Prothorax wider than long, sides strongly rounded in front, then sinuate to the base, which is much narrowed, and slightly emarginate; side-margin feebly punctulate, strongly reflexed, hind angles rectangular; impressions and dorsal line deep, base feebly punctulate. Elytra regularly oval, scarcely wider than the widest part of the prothorax, less elongate than in *N. ingens;* striæ deep, slightly punctulate, 3d interspace with three dorsal punctures, 7th interspace with two, the posterior of which is about the middle of the length; prosternum flattened at tip, slightly declivous, not margined. Length 11.5^{mm} (0.45 inch).

One ♂. Sierra Nevada, Cal. Less elongate than *N. ingens*, and differs by the wider prothoracic side-margin and flattened and broader prosternal tip.

4. N. PURPURATA, *n. sp.*

Elongate, as slender as *N. gregaria*, black, elytra purple, but without metallic gloss. Head with the eyes scarcely narrower than the prothorax. Prothorax wider than long, rounded on the sides before the middle, then narrowed, and not very suddenly sinuate; hind angles rectangular, prominent, side-margin not narrow, strongly reflexed; all the impressions are deep, and the disc each side of the median line has a large deep puncture, which is probably accidental. Elytra elongate-oval, but little wider than the widest part of the prothorax; humeri well-rounded, not prominent; striæ deep, feebly punctured; 3d, 5th, and 7th interspaces interrupted by two or three punctures in the posterior third of the length; on the 3d interspace there is also a puncture on the left elytron one-fifth from the base. Length 12.5^{mm} (0.5 inch).

Leavenworth Valley, above Georgetown, Colo.; altitude, 9,000 to 10,000 feet; Mr. Bowditch; one specimen, with legs and antennæ mutilated.

5. N. TRIFARIA, *n. sp.*

Elongate, slender, black. Head with eyes scarcely narrower than prothorax, the latter one-half wider than long, rounded on the sides before the middle, then narrowed and strongly sinuate; hind angles rectangular, prominent; side-margin not narrow, strongly reflexed; transverse impressions and dorsal line deep, base punctulate, basal impressions deep. Elytra elongate-oval, humeri well-rounded, not prominent; striæ deep, impunctured; 3d, 5th, and 7th interrupted with large punctures, which vary in number from four to five, distributed to within one-third or one-fourth of the length from the base. Length 13^{mm} (0.52 inch).

American Fork Cañon, Utah; 9,500 feet altitude; Mr. Bowditch. This species resembles in form *N. gregaria*, but the sides of the thorax are more strongly margined and more sinuate towards the base. The punctures of the elytra are larger, so as to interrupt the interspaces, and the color is not piceous in tint, but full black: the outline is less slender, though not as stout as in *N. metallica.*

11. N. LONGULA, *n. sp.*

Elongate, slender, shining black, with a piceous reflection. Prothorax nearly twice as wide as long, rounded on the sides and strongly margined, narrowed behind; basal angles obtuse, not at all rounded. Elytra elongate, slightly wider behind, subtruncate at base, humeri rounded, basal fold not forming a distinct angle with the margin; striæ fine, impunctured, interspaces flat, 3d with three dorsal punctures adjacent to the 3d stria. Prosternum flattened and finely margined at the tip. Legs black. Length 9^{mm} (0.36 inch).

Colorado; locality unknown; one specimen, given me by Mr. Ulke. This is very closely allied to *N. suturalis*, and differs from that species only by the legs being black and the elytral striæ finer. Large series from more varied localities will perhaps show that it is to be considered more properly as a race of that insect.

12. N. OBLIQUA, Lec.

North Fork of South Platte Cañon (7,000 to 8,000 feet); Mr. Bowditch.

13. N. OBTUSA, *n. sp.*

Elongate, slender, piceous-black, shining, palpi, antennæ, and legs pale. Head, with the eyes, narrower than the prothorax, eyes convex, somewhat prominent. Prothorax nearly twice as wide as long, sides much rounded in front of the middle, obliquely narrowed and not sinuate behind; front angles prominent, subacute; hind angles obtuse, not rounded; side-margin narrow, reflexed, base truncate; transverse impressions deep, longitudinal line strongly impressed, basal impressions deep, not punctured. Elytra a little wider than the prothorax, sides nearly parallel, humeri broadly rounded; striæ fine, feebly punctured, outer ones nearly effaced; three or four dorsal punctures on the 3d stria. Last ventral segment rufo-piceous (from the immaturity of the specimen). Length 11^{mm} (0.43 inch).

Green River City, Wyo., (6,000–7,000 feet); Mr. Bowditch. This species closely resembles *N. Eschscholzii* from Alaska, Vancouver, and British Columbia, and has equally long legs and antennæ. It differs, however, by the sides of the prothorax not sinuate towards the base, with the hind angles obtuse; and by the elytra being less convex, more oblong, with the sides more nearly parallel, and not wider behind.

The geographical distribution of these groups may be recapitulated as follows:—

GROUP I.—Two species from high mountains of the Sierra Nevada, and one from lower levels, near the Pacific coast.

GROUP II.—Two species from high mountains of Colorado; one from Sierra Nevada, nearly allied to them; a smaller one (*N. carbonaria*), less similar, from the Alaskan Islands and Kamtschatka, but somewhat resembling *N. suturalis* of Group IV.

GROUP III.—Two Alaskan species, extending to Vancouver and British Columbia.

GROUP IV.—Of this group, five are Alaskan, one of which, *N. Gebleri*, extends to Vancouver; one, *N. Sahlbergii*, extends over the whole hyperborean region of North America, from Alaska to Canada, southwards to Vancouver on the western coast, and has left a post-Glacial colony on the White Mountains in New Hampshire; two others, *N. suturalis* and *hudsonica*, are hyperborean; they do not extend to Alaska, but the former has left a colony on the White Mountains, and the latter occurs from the Saskatchewan to Newfoundland; another, *N. nivalis*, a Northern European species, is found in Iceland and Greenland, but as yet has not occurred on the mainland of this continent; it is very closely allied to *N. hudsonica*, differing chiefly by the more prominent hind angles of the prothorax and by the red legs. The remaining three are from the mountains of Colorado, and one of them seems near to *N. suturalis*, while the other two, *N. obliqua* and *obtusa*, are rather isolated, and perhaps only color varieties of one species.

GROUP V.—Contains a very peculiar isolated species from the coast region of California and Vancouver Island.

GROUP VI.—Contains an equally isolated species from the Atlantic slope of the continent, from Canada to Georgia and Minnesota to Nova Scotia.

If we disregard the color of the antennæ, palpi, and legs as having no specific value, a certain reduction in the number of species may be made; and this would be fully justified by the observations published in regard to European species. We would then have—

N. Eschscholzii Mann. as a color variety or race of *N. Mannerheimii* Esch.;

N. obtusa Lec. as a color variety of *N. obliqua* Lec.

Of the species thus reduced, the only ones which exhibit a close relationship to Palæarctic forms are the hyperborean Groups III and IV. Of the latter, I am disposed to believe that *N. obtusa* and *obliqua* are pre-Glacial Rocky Mountain species, while all the others are dispersions from the later Tertiary circumpolar land, from which came many of the forms identical, or representative, now found in the northern parts of both continents.

Groups I and V must be considered as peculiarly belonging to the Pacific region, and not derived from Glacial migration.

Group VI is similarly related to the Atlantic region. Of Group II, the Californian and the two Rocky Mountain species cannot be connected with Glacial migration, and were, therefore, probably pre-existing species *in situ* during part of the Tertiary age; *N. carbonaria*, from its resemblance to some species of Group IV, belongs to the circumpolar dispersion.

Collections made along the edge of retreating snow-fields in the higher parts of the Coast Range, Sierra Nevada, and Rocky Mountains will probably show the existence of other species of the groups peculiar to those regions; but as yet the materials from high mountain elevations are very scanty.

ART. XXI.—ON THE ORTHOPTERA COLLECTED BY DR. ELLIOTT COUES, U. S. A., IN DAKOTA AND MONTANA, DURING 1873-74.*

BY PROF. CYRUS THOMAS.

LETTER OF TRANSMITTAL.

CARBONDALE, ILL., *October* 18, 1875.

SIR: I transmit herewith a report on the collection of *Orthoptera* submitted to me for examination.

Although the collections are small, they are of considerable interest, as adding to our knowledge of the distribution of species, some of which find their northern limit in the region where your collections were made.

The more we study the habits of *Caloptenus spretus*, which is well represented in your collections, the more important does a thorough knowledge of the western limit of your line of operations become. Although the entire Rocky Mountain region may be said to constitute the native home of this locust, yet the region about the headwaters of the Missouri appears to form a fertile source of the swarms which sweep east and southeast upon the border States and the plains of Manitoba. As this is a subject of great importance, and one in regard to which our national government is no doubt anxious to gain all possible information, I have added a somewhat lengthy note in regard to its operation.

The list is comparatively small; but it should be remembered that *Orthoptera* rapidly decrease in species as we penetrate into these northern sections. Mr. Henry W. Elliot informed me that although he made a careful examination he was unable to find a single specimen in the section of Alaska in which he was stationed. Kirby's list, as you will see by examining the "*Fauna Boreali-Americana*", is quite meagre. I find no new species, at least none that I feel warranted in considering new, although varying considerably from the types of the species to which I have referred them. It is possible that the *Gryllus* which I have referred to *abbreviatus* is new; but before this can be determined, the

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[* These insects form part of the collections made by me as Surgeon and Naturalist of the United States Northern Boundary Commission, Archibald Campbell, Esq., United States Commissioner, Maj. William J. Twining, United States Engineers, Chief Astronomer. They were all taken on or near the parallel of 49° N., along the northern border of Dakota and Montana.

The same remark applies to the two next succeeding articles, by Mr. Uhler and Mr. Edwards.—ED.]

species of that genus will have to be more carefully studied, which will require a comparison of a large number of specimens.

In giving the names of species in my Synopsis, I adopted the plan which appears to prevail in this country of attaching the name of the author of the combination (generic and specific) used. I am convinced that this is objectionable, and that the name of the original describer of the species should be given, and hence have followed this method in this paper, and propose so doing hereafter.

As will be seen, some reference is made to Stål's "*Recensio Orthopterorum*"; but the changes in that work have not in all cases been adopted.

Respectfully yours,

CYRUS THOMAS.

Dr. Elliott Coues, U. S. A.,
Washington, D. C.

ACRIDIDÆ.

1. *Stenobothrus curtipennis* Harr.

The specimens in the collection belong to the long-winged variety (*St. longipennis* Scudd.).

Stål restores the name *Gomphocerus* of Thunberg, and in his "Conspectus Generum" makes it equivalent to *Stetheophyma* Fisch., *Arcyptera* Serv., *Chrysochraon* Fisch., and *Gomphocerus* Thunb., yet in the body of his work he gives *Stetheophyma* Fisch. as a distinct genus. In a former paper, "Freg. Eug. Resa. Ins. Orth. 1860", he seemed disposed to include in this genus the greater portion of the Tryxaloid *Œdipodæ*. For example, we find him including under this, as subgenera or otherwise, the following genera of his present work:—*Sinipta*, part of *Tryxalis*, *Phlæoba*, *Pnorissa*, *Gomphocerus* Thunb., *Epacromia* Fisch., *Scyllina*. Of course, the subgenera then named foreshadowed his intention to subdivide the genus, yet his use of the latter shows that he was following too closely Thunberg, notwithstanding the great advance made by Charpentier, Burmeister, Serville, Fischer, and others. It is true the characters of *Stenobothrus* as given by Fischer fail to include all the species which evidently belong to the group. But the difference between the *Stethcophymæ* and typical *Stenobothri* of Fischer, it appears to me, is too clear in its character to associate them in one restricted genus when other genera have been separated from the group on such slight characters.

2. *Tomonotus tenebrosus* Scudd.

Specimens of the typical form and that I described as *pseudo-nietanus* are in the collection; the latter, as a general rule, is smaller than the former, and is very distinctly marked with the pale stripes along the sides of the pronotum. The locality at which these specimens were obtained forms, so far as known, the northern limit of the range of this species, which extends south to New Mexico, east to Illinois and Saint Paul, Minn., and west a short distance beyond the range of the Rocky

Mountains in Wyoming, according to the specimens I have examined; but if I am correct in regard to a species Stål has described, it is found as far west as Vancouver's Island. This writer has described as new, under the name of *Arphia sanguinaria*, a species from this island which is undoubtedly Scudder's *tenebrosa.*

Why this author has replaced Saussure's *Tomonotus* with *Arphia*, when it includes the same species, it is difficult to say.

3. *Hippiscus phœnicoptera* Germ.

The number of specimens in this collection indicates that this is quite common in the regions where the collections were made.

While traveling through Southern Dakota in 1873, I noticed that, as I advanced toward the northwest, *Œdipoda* (*Hippiscus*) *rugosa* approached nearer and nearer in its characters to *H. phœnicoptera*, especially in the color of the wings and the spots on the elytra.

4. *Œdipoda kiowa* Thos.

5. *Œdipoda gracilis* Thos.

Specimens of both these little species are found in the collections; this gives the northern limit of their range, so far as known.

It is probable both species will have to be removed from *Œdipoda* as that genus is now restricted, but at present I am unable to state whether either will fall into any existing genus. The former will, in all probability, fall into the same limited group as *Œ. longipes* Charp.

6. *Œdipoda neglecta* Thos.

Dr. Coues's discovery of this species along the northern boundary and my discovery of it in Illinois show that it has a much wider range than I at first supposed.

7. *Caloptenus spretus* Thos.

See note in regard to this destructive locust at the end of this paper. It will be observed that I have placed my own name after this species, indicating thereby, according to what I have previously stated, that I claim to be the author. This I believe I have the right to do, as no regular description is to be found anywhere previous to that I have given, which distinguishes it from *C. femur-rubrum.* Mr. Uhler did not describe it, and does not claim to be the author. The name was first given in my paper published in the Illinois State Agricultural Report.

According to Stål's arrangement, there are no species of *Calopteni* in the United States; this and *femur-rubrum* belonging to *Pezottetix*, subgenus *Melanophus.*

There is no doubt that the *Calopteni* and *Pezottetigi* of North America need revision, but I have strong doubts as to the correctness of Dr. Stål's conclusions, which lead him to restore *Calliptamus* of Serville, corrected into *Calliptenus*, drop *Caloptenus* of Burmeister entirely, and transfer *femur-rubrum* and other long-winged *Calopteni* to *Pezottetix;* and I have given my reasons for these doubts in another place.

8. *Caloptenus bivittatus* Say.

The specimens of this species are few, and considerably under the usual size; in fact, some are scarcely an inch long.

9. *Caloptenus occidentalis* Thos.

A specimen which appears to belong to this species is in the first collection. I found it quite numerous at Glyndon and Moorhead in the Red River Valley. It approaches very near to the variety (or species) which Professor Riley has named *C. atlanis*. The size, appearance, movements, bluish cast of the wings, all remind one very strongly of the latter. The tip of the last ventral segment of the male does not agree with either *spretus*, *femur-rubrum*, or *atlanis*, being rather more pointed than either, but not notched.

As will be seen in the note on *spretus*, it may be possible after all that these are but varieties of *femur-rubrum*, and that the differences are owing to climatic influences.

10. *Pezotettix borealis* Scudd.

11. *Pezottetix speciosa* Scudd.

I find in the collections specimens which appear to belong to these species, yet they vary somewhat from the characters given.

12. *Tettix granulata* Scudd.

A single specimen, which I have referred with some doubt to this species.

I add the following list of *Acrididæ*, which have been found in the Pembina region, but are not represented in these collections, which are given here in order to complete the Boundary Line Acridian List so far as known.

13. *Œdipoda verruculata.*

14. *Stenobothrus æqualis.*

15. *Stenobothrus speciosus.*

16. *Stenobothrus maculipennis.*

17. *Stenobothrus æqualis.*

18. *Stenobothrus propinquans.*

The northern limit of some of these may be in Minnesota, but it is presumable that most extend to the boundary; some are known to. It is somewhat strange that *Œ. carolina* is missing from the collections.

LOCUSTIDÆ AND GRYLLIDÆ.

The *Locustidæ*, although very few in number, indicate a treeless region, there being but a single specimen (a small *Phaneroptera curvicauda*), which selects a bush or tree for its habitation.

19. *Ceuthophilus* ——— ?

Specimen too much injured to determine the species; probably *C. divergens* Scudder, which, so far as preserved, it strongly resembles.

20. *Udeopsylla robusta* Scudd.

This species, though never found in considerable numbers in any place, is nevertheless found over a great part of the West. I recently observed it at Bloomington, Ill., while attending a teachers' natural history institute held at that place, which shows it is found east of the Mississippi

21 and 22. *Anabrus purpurascens* Uhl.

I may add also *A. coloradus* Thos., which, though not found in the collections, I received from Manitoba from another source.

23. *Phaneroptera curvicauda* Serv.

As the specimen is alcoholic, and much smaller than usual, I have placed it in this genus with some doubt.

24. *Orchelimum* ——— ?

25. *Gryllus abbreviatus* Serv.

There are several specimens in the collection, some in the pupa state, and some apparently in the perfect state; but they are much smaller than the usual size of this exceedingly variable species. They may possibly belong to Scudder's *G. niger*.

NOTE ON CALOPTENUS SPRETUS.

The great locust invasion of 1874, and the resulting broods of 1875, have called renewed attention to this species, and have brought it more prominently before the world than it has ever been heretofore. They have raised several important questions, both economic and scientific, some of which may ultimately be distinctly and satisfactorily answered, while others will perhaps always remain matters of conjecture only. Among the economic or practical are the following:—Are there any means of preventing their migrations? and, if so, what are they, and are they practicable? What means have the agriculturists of defending themselves against their attacks? As relating to both the scientific and economic are the following:—Were there such eruptions into the same regions before the entry of civilized man? Are their incursions growing more and more frequent, and are their limits being extended farther and farther eastward? If the facts require this last question to be answered in the affirmative, then how is it to be accounted for? Is there any danger of their becoming permanent residents of the Mississippi Valley? Is it at all likely that they will ever penetrate to the States east of the Mississippi? Is *C. spretus* a distinct species, or are

C. femur-rubrum, *C. atlanis*, *C. occidentalis*, and *C. spretus* but varieties of one and the same species?

Most of these are important questions, and deserve a more careful consideration than I am at present able to give them, not only for want of time, but also for want of the proper data. Before this can be done, the whole subject will have to be more thoroughly investigated; and as the region over which these winged messengers of destruction roam is very extensive, and much of it unoccupied, except by savage Indians and a few military posts and stations, this investigation can only be properly made under the sanction and with the aid of the national government. It will be absolutely necessary to have the aid of the military posts as points of observation, and hence could probably be best performed under the military department. I will only attempt in this note to give some facts and opinions bearing upon some of the points mentioned.

First. Are there any means of preventing the migration of these locusts? It is evident that if they are all destroyed, this will prove a specific against future migrations. To do this our attacks must be directed chiefly against the eggs and the young in their native haunts or hatching-grounds. Is this practicable? If their total destruction is not possible, the next important inquiry is, Can the eggs or young be destroyed in the hatching-grounds from which the swarms come that devastate our border States? In order to answer this question correctly, it is requisite that the swarms which visit these States be traced positively to their original hatching-grounds. Although Arabia and Central Asia are given as the native habitats and hatching-grounds of *Œdipoda migratoria*, yet after a somewhat careful search of the records I have not been able to find a single instance in which a horde visiting Europe has been traced positively to its original hatching-grounds in these regions from which they are supposed to have come. Even as late as 1836, Serville had to confess that though the locusts had been a plague for thousands of years, yet their habits and history were not well understood. Köppen's late investigations in regard to this species, though valuable, appear to throw but little additional light upon its history. Here the starting-points and the termini of the migrations of these locusts are within our own territory, no part of which is inaccessible to man, while a very large portion of the West is traversed by railroads and telegraph lines. Military posts and stations are here and there in the area not occupied by settlements. It is therefore certainly possible by proper effort to trace their movements from one extremity to the other.

Let us now for a moment inquire into the possibility, or rather practicability, of utterly exterminating these insects by destroying their eggs and young in their native haunts.

Their hatching-ground is known to extend over the vast area roughly designated by the following boundary lines:—On the east, the 103d meridian; on the south, the south line of Colorado and Utah; on the west, the west line of Utah extended north to British America; the northern line being somewhere in British America—even this area in the northern part being expanded indefinitely east and west.

Now for the proof.

While connected with the United States Geological Survey, under Dr. Hayden, for four years, I traveled over a large portion of the area mentioned, traversing it on various lines east and west and north and south, studying somewhat carefully the habits of these destructive locusts. During this time I noticed them in the larva and pupa state, or depositing their eggs, at the following places:—At various points along the east base and in the bordering valleys of the mountains in Wyoming and Colorado, from North Platte, near Fort Laramie, to the Arkansas River; in Laramie Plains and around Fort Bridger; from Utah Lake in Utah to Fort Hall in Snake River Valley, Idaho; in Northwestern Dakota near the Red River of the North, and on both sides of the range in Montana along the valleys of Deer Lodge River, and the branches of the Upper Missouri. I also obtained satisfactory proofs of the same thing occurring in British America north of Dakota, in Middle Park, Colorado, and in the regions west of that point, in Wind River Valley in Wyoming, in Central Montana along the Yellowstone, and in the Green River country west of South Pass. These facts, which are but a small portion of what might now be gathered, will give some idea of the work necessary to be done if we undertake to exterminate these insects by destroying their eggs in their native haunts.

In order to further illustrate, and better understand the point now under consideration, I will present some facts in regard to their migrations in and from the mountains and northern regions, which will assist the reader in forming a more correct idea of their habits, and the extent of their operations,—and here be it remembered I confine myself to the single species *Caloptenus spretus*. I have traced a swarm from the area west of South Pass to their stopping-place and hatching-ground north of Fort Fetterman, from Northeastern Dakota nearly to Lake Winnipeg, and have ascertained that some swarms have extended their migrations from some supposed southwest point as far as the north side of this lake. It is also known that, in one instance at least, those which left Colorado moved in the direction of Texas; those visiting Salt Lake Valley have repeatedly come from the northeast, sometimes doubtless from Cache and Bear River Valleys, and others from the Snake River region; while those hatched in Salt Lake regions moved south, in some instances returning with the change of wind. In 1864, those hatched east of the mountains of Northern Wyoming and along the Yellowstone in Montana swept down the east flank of the range upon the fields of Colorado, while a part moved east to Manitoba and Minnesota. In 1867, a swarm from the west side of the range poured into Middle Park, and there deposited their eggs, but those hatched from these failed to scale their rocky bounds; yet while these were vainly striving to leave their mountain prison, another horde from the barren regions beyond, sweeping above them over the snowy crest, poured down upon the valleys east; and in another instance a swarm was seen passing for two days over Fort Hall from the southwest. On the other hand, we find them extending their flight far into Texas in destructive hordes, yet New Mexico and Arizona appear to be apparently free from them; at least, the very extensive collections made by Lieutenant Wheeler's expeditions in these Territories during the last four years, which have been submitted to me, contain but very few specimens of the *C. spretus*, and during my visit to New Mexico in 1869 I found scarcely any specimens south of Raton Mountains, although comparatively abundant in Colorado, and even in the San Luis Valley. I am, therefore, inclined to doubt the correctness of the statement made by Mr. Taylor (in Smithsonian Report, 1858) in reference to the grasshoppers in these Territories in 1855, if intended to apply to this species.

These facts, if added to the experience in Kansas, Nebraska, Dakota, Minnesota, and Manitoba, will suffice to show, not only how extensive is their range, but also how varied their flight, and that there are no particular spots which can be said to form their permanent hatching-grounds. That they prefer the elevated sandy plateaus and terraces in the mountain districts is certain; but that any particular localities form the permanent hives from which the swarms issue cannot be maintained; yet that those which visit Kansas and Nebraska, and even Dakota and Minnesota, originate usually in the Upper Missouri region and adjacent parts of British America is now pretty well ascertained. We may therefore set it down as impracticable to attempt their extermination by destroying their eggs and young in the various hatching-grounds scattered throughout this extensive range. It may be possible by preserving the grass in the last-named section, and burning it at the proper time, to destroy the unfledged young.

While there are exceptions to the rule, yet it is evident that their general course of flight east of the mountains and south of the boundary line is southeast. I have no positive information on this point in reference to the region along and north of the boundary line, and therefore hope Dr. Coues will add an account of such facts in this respect as came under his personal observation or such reliable information as he may have ascertained. The distance traveled by any particular swarm, as is evident from what has heretofore been said, has never been positively ascertained, yet enough is known to indicate that this may extend for at least two and possibly three hundred miles.

The hordes which visited Colorado in 1864 are supposed by Colonel Byers, from certain evidence then ascertained, to have originated in Montana along the Yellowstone; and a swarm which I traced through Sweetwater Valley in 1870 probably moved over two hundred miles; yet the evidence, though highly presumptive, is not positive in either case.

Now, let us examine briefly the history and characters of their migrations in the Mississippi Valley, and see what important facts bearing upon the question of a preventive can be ascertained, and especially as to the places from which individual hordes which visit this region take their departure. But first I desire to present a few facts in regard to the Eastern locust, *Œdipoda migratoria*, as indicative of what we may probably expect here. The earlier invasions of Europe by this species are always said to be from Arabia or the interior of Asia, as, for example, the horde which visited Silesia in 1542, the regions around Milan in 1556, and of Marseilles in 1613. But as observations began to be more exact, and the records more perfect, we hear of intermediate stations and less extensive single marches; for example, the invasion of Hungary and Germany in 1693 is said to have been from Thrace, much nearer the scene of their depredations than the locality given former hordes. The great European invasion of 1749–50 was the result of several steps; in 1747–48, it is stated, they came from Turkey into Wallachia, Moldavia, Transylvania, and Hungary; from thence, in 1749, they passed into Austria, Bavaria, and other parts of Germany, and from thence, in 1750, reached the Mark of Brandenburg. But beyond Thrace in the one case and Turkey in the other nothing is known of their progress. I am aware that seemingly well attested instances of flight from three to five hundred miles from shore are given; and also the very common statement of their passage across the Mediterranean; but Hasselquist, and also Zinnani, who lived at Venice, deny the truth of the latter statement; and the leading orthopterologist of Europe was unable to correct them, if wrong, as late as 1853.

It may, therefore, be possible that when we can trace the swarms which visit Kansas and Nebraska to their hatching-grounds, we will find them not so far distant as is now generally supposed. As bearing on this point, I give the following facts and statements, partly from the full records of Mr. Walsh, Professor Riley, the Agricultural Reports of Kansas, and Agricultural Department at Washington, and from my own knowledge.

It appears from the Canada Farmer, as quoted in Riley's Report, that in 1857 these insects visited the Assiniboine settlement in Manitoba. Now, by turning to Mr. Taylor's account of the locusts as given in the Smithsonian Report of 1858, we find that they were very destructive to the grass of the Plains that year, from the Upper Missouri to Fort Kearney, and migrating. There may be no connection between the two, but subsequently, in 1871 or 1872, swarms appear to have passed up from Dakota to Manitoba, indicating a disposition in this northern section to move northeast. In 1864, we hear again of invasions of Manitoba and Minnesota, and this year the great hatching-ground also appears to have been the Upper Missouri and Yellowstone region. But the great mass this season appears to have spread southeast and east upon the Plains, sending a strong wing down the mountain flank to

Colorado, and another detachment into Minnesota, but not reaching the settlements of Nebraska and Kansas. In 1866, we find them spreading over Nebraska and Kansas, and even reaching Missouri and Texas, an invasion which has almost universally been attributed to a direct importation from Colorado.

Is the opinion correct? Was it not in fact a continuation of that of 1864, and, if so, thus showing that these invading hosts have intermediate stopping-grounds on the great plains, as did the advancing hordes of Asiatic locusts in Europe, and probably even beyond the Bosphorus? In the first place, there is no sufficient proof of any such swarms leaving Colorado in 1866; but, on the contrary, the most competent authority in the Territory, Colonel Byers, asserts the opposite in his letter to me, which is published in the Report of Hayden's Geological Survey for 1870. In the second place, as it appears that the great hive of 1864, from which the swarms issued, was Eastern Montana, Western Dakota, and Northeast Wyoming, it is scarcely probable that it would send forth but two lines, one towards Minnesota and the other towards Colorado, and these at right angles to each other, while the usual direction of air-currents, by which they are carried, is along the diagonal. Again, the advanced guards of those which reached Colorado, and which doubtless came from the nearest hatching-ground, after stopping here a short time, passed off southeast in the direction of the Arkansas River. We hear nothing further of them in 1865; but as the remaining portion of the horde of 1864 stopped in Colorado, it is not probable that these proceeded very far, but that they deposited their eggs in Southeast Colorado. The brood of 1865 may have advanced but a short step farther, and then in 1866 those which entered Texas were the first of the advancing column, for it was not until 1867 that the storm fell in its full force upon the interior of that State, and then not until late in the season—October and November.

Advancing north, we find a corresponding state of affairs. Those which hatched in Colorado in 1865 left there in June and passed out upon the Plains. By turning to the Monthly Agricultural Report of 1868, we find it stated that they were in Arkansas (Montgomery County) in 1867. If we suppose those from the section farther north moved in a southeast direction, they would probably have reached the region immediately south of the Black Hills of Dakota; and it is from this section it is supposed by some that those which visited Iowa came. The time of arrival in Kansas and Nebraska would show a similar rate of progress to the lines already traced, and on this point we have some very strong corroborating testimony.

Mr. J. A. Allen, of Cambridge, Mass., who was in Western Iowa in 1867 collecting plants and insects, states that on September 5 he beheld a flight of myriads of grasshoppers coming from the northwest and alighting so thickly as to cover the ground; that on the 13th he saw another immense flight coming from the same direction. He adds, that "their progress was readily traced from the north and west, and their origin was undoubtedly Dakota and Nebraska, where my friend O. H. St. John observed them in abundance in the larva state in May. He also noticed them at or near Sioux City, and at other points on the Iowa side of the Missouri River."

The facts in regard to the direction from which the hordes of 1874 came is also corroborative of the opinion advanced. And, finally, a fact which at first appears to stand opposed to this opinion, when carefully considered, really goes to strengthen it, if applicable to the general halt. The evidence in regard to the arrival of the hordes of 1866 in Kansas rather tends to show that they came from the west, and, in some instances, from the southwest. As it is shown by equally strong evidence that they did not come from the inhabited portions of Eastern Colorado, they must have come from the intermediate Plains, and if they were from the mountains they must have passed down first, then have changed their course and returned, while another portion passed on to Texas, which is a far more violent presumption than that which I have given, which is, that they were hatched on the Plains as the successors of those which left the northwest in 1864. But where such change of course occurs in the interior of the settled portions, it may be merely a short flight from a neighboring section after their first halt, and argues nothing then; but the evidence in this case appears to apply to their general direction, and not to a merely local movement.

I have dwelt somewhat at length upon this point, because I have long had doubt in regard to the correctness of the idea that all swarms which invade these border States sweep down from their distant hatching-grounds in a single generation, as if they knew, by a kind of new and recently obtained instinct, rich fields of corn were to be found in Kansas, Nebraska, and Minnesota. I had hoped the facts in regard to the recent invasion would settle this question; but as these have yet to be gathered, except a few which correspond to those of 1867, and agree with the view I have advanced, we must for the present rely on those already known in reference to past incursions.

It is certainly strange that they should always pass over this belt of two or three hundred miles, on which herds of buffalo have flourished for ages, without making a halt. Where do the numerous hordes go which leave the mountains, but never reach the settlements on the east side? Most undoubtedly, they spend their force upon the Plains; probably finding sufficient nourishment in the grasses of this area, they remain, diminishing year after year in numbers or gradually losing their migratory disposition.

Let us now consider for a moment the possibility of fighting these hordes from the fields after their arrival, or of destroying them by direct means and mechanical appliances. In the first place, it is impossible to tell just when they are coming and when they will alight, so that even were the national military forces detailed for the purpose in question, they might be waiting in Minnesota for the coming storm, while it descended on the fields of Kansas; or, if scattered, their effectiveness would be destroyed. But suppose that by properly arranged telegraph lines notice should be given from the western side of the plains that a horde was moving, and that, from the direction of the wind, &c., it might be expected along a certain line, and that the Army should be waiting at the proper point, how much is it possible a corn-field of 160 acres would be worth after a company of unwilling soldiers had fought grasshoppers over it for two days? Writers and others in attempting to show or illustrate what may be done in this country by what is done in other countries too often forget the vast difference in the rights of individuals in the two. They forget that the soldier here is a *man* and a *citizen*, and not a mere machine, and while always willing voluntarily to assist in time of distress and calamity, without debating whether there is any obligation to do so, when this is made a requirement, it is a very different thing with him. The result would therefore, beyond all doubt, prove wholly unsatisfactory.

The want of the time and place of the arrival of these hordes are very material difficulties to commence with. But let us suppose all the farmers of our border States were thoroughly armed and equipped with all the machinery, nostrums, and patent appliances American ingenuity and entomological science could devise. What could they do in the way of contending with one of those immense swarms which sweep down upon them in such countless myriads?

As a large portion of the readers of this have never witnessed the movements of one of these swarms, and in order to illustrate in as forcible a manner as possible the difficulties under which our border farmers labor at such times, I ask them to take their stand with me, in imagination, on one of those beautiful grassy hillocks everywhere met with in Kansas, Nebraska, Dakota, and Southwestern Minnesota. First, look over the spreading valleys outlined with graceful curves, and sweeping downwards with scarcely perceptible slope towards the south, while beyond in every direction the rolling prairies stretch out as far as the eye can reach, while somewhat regularly over their surfaces (consequent upon the alternate section land-grants) like little islands in the sea are seen the farms. Compare the amount of occupied and actually cultivated land with the broad surrounding expanse of unoccupied land. Let the reader now extend his imagination a little farther. It is a beautiful morning, about the first of August; not even a fleecy cloud specks the sky, although a refreshing breeze is sweeping down from the northwest; the fields of corn in sight reflect the silvery beams from seas of waving leaves, while their tasseled heads gently bow before the breeze. All at once, about ten o'clock, a dark shadow is seen moving rapidly over the plains from the northwest; the rays of the sun are suddenly cut off, and the entire scene appears as though beneath some vast canopy which has been overspread. But in a moment the mystery is explained; for gazing upwards we behold the heavens filled with broad, living, silvery snowflakes, and then a shower thick as rain, but dropping like pebbles, striking our hats, hands, and upturned faces and the ground around with a sudden and peculiar thud. Grasshoppers, grasshoppers by the million! is the exclamation which explains the mystery.

Onward they come a dark continuous cloud
Of congregated myriads numberless,
The rushing of whose wings is as the sound
Of a broad river headlong in its course
Plunged from a mountain summit, or the roar
Of a wild ocean in the autumn storm,
Shattering its billows on a shore of rocks.

We watch the myriads of restless workers for a few hours, and ere the sun has set see the corn stripped of its green leaves, and the beautiful green covering of the scene changed to an almost barren waste.

It is true this is given as an imaginary sketch, but those who have beheld the arrival of these hordes will scarcely consider it greatly exaggerated or far from correct.

Numerous letters and statements from eye-witnesses of the late invasion might be given which would show that the picture I have given is not overdrawn. In one of the letters in Professor Riley's Report for 1875 I find the following statement, which shows the rapidity with which these devourers work:—"They appeared on Sunday, July 26, at about 6 o'clock p. m. They were so thick in the air that they appeared like a heavy snow-storm; those high in the air forming apparently light, fleecy clouds, while those dropping to the earth resembled flakes of falling snow. Next morning, Monday, the 27th, at daylight, the country was literally covered with grasshoppers. Soon after sunrise they collected on the growing crops, young trees, etc., and commenced eating, and before night had eaten the leaves from almost every green thing." A resident of Nebraska, whose place I had visited before the invasion, describing their appearance, stated that they arrived about 10 a. m., darkening the sky with their numbers; that by 3 p. m. the corn—the chief crop of that section—was completely stripped of its blades.

Now what can the farmer do with the one or two assistants of his family, aided by all the appliances they could operate, in preserving a field of eighty or a hundred acres of corn from such an attack as this; especially when we remember that as soon as it is cleared of one set of these devourers, another stands ready to pour in upon it from the surrounding prairies? Beside, there can be no combination of forces, for at such times all are similarly situated, and delay is fatal. So far, man appears to be powerless at such times, as with the force the pioneer farmers of these border States usually have at command but little progress could be made towards harvesting their crops after the swarms have appeared, and even if this were possible, which is seldom the case, it is usually valueless except as fodder; but even this would be worth the trouble, as it would assist in preserving the stock.

The farmer on such occasions usually sits down in blank despair, and in gloomy silence beholds the work of destruction; nor can we wonder at it when we consider the suddenness and magnitude of the attack. It is therefore certain that the only means of counteracting these inroads must be preventive; and therefore it may well be asked, What are they, and are any of them feasible?

1st. It would certainly be in vain for even the national government to attempt to exterminate these insects by destroying their eggs in the various hatching-grounds which extend from British America to Colorado.

2d. If the swarms which reach the border States come from a limited area along the east flank of the mountains, the destruction of the eggs by any temporary means, even if possible, would be of comparatively little value, as the hordes sweeping down from the mountain regions would soon replace them. Irrigation, so far as I can see, is the only permanent means, and this, I am satisfied, from a careful study of the drainage of these regions, is possible only in the area named, and in a portion of that section of the Upper Missouri west of the Judith Mountains.

3d. Signal-stations in these regions connected by telegraph lines with the section they visit might possibly give warning in time to gather such crops as would be of value, but these lines would have to be so arranged as to trace the usual line of march of these insects. What effect firing the prairies on their approach would have I am unable to say, but it is possible this might cause them to move on, as was the case in some instances mentioned in the accounts of their invasions recorded.

4th. Although I have but little faith in Indian industry, yet it may be that a premium offered for eggs and grasshoppers would induce Indians to gather them in the regions over which they roam; and, as the government undertakes to feed these people, it might be well enough to make the trial, and thus perhaps beget in the younger Indians some faint idea of industry and its results. If the experiment should prove successful it would be some help, be it ever so small, towards staying the ravages of these locust pests, and it would be simply another mode of paying the Indian, and, if rightly planned, no additional expense to the government.

As regards the resulting brood, the farmer does not appear to be so helpless as he does with the incoming hordes. The former coming gradually, and presenting various points of attack, does not fill him with terror, as do the suddenness and magnitude of the attack in the latter case. In an article of mine, recently published in the Prairie Farmer, I stated that the farmers, after a few years' experience with these insects, generally learn all the means of local defense possible; and, as a general rule, the entomologist must learn these, not from any scientific knowledge of the insect, but from the practical experiments made by the farmer. All modes of attack and defense which depend in any way upon the knowledge of the habits of the insect which are not patent to the unscientific eye, the entomologist is expected to perceive sooner than those who are not entomologists.

Although the farmer does not feel himself so helpless before the hatching brood as he does before the migratory hordes, still that he does not feel able to entirely control them, even after long experience, is shown by the following extracts from a letter sent me this season by a Nebraska farmer, who has some practical experience in the matter:—"I am a hard working farmer, forty-six years old; came to Nebraska in 1855; have a good farm and seven children, and would be getting along very well if the grasshoppers would let me alone. They are getting worse and we cannot stand it much longer. I only got five bushels of corn to the acre last year, yet I had to help others; and now we have millions of 'hoppers' again. Plowing, rolling and burning does but little good. Wise men say there is a parasite killing them. Well, we know something of the 'hoppers' and the parasite; it never kills many of them, nor any of them until they are nearly grown. But the birds eat millions of them before they are larger than a grain of wheat. The small grasshoppers are too quick for domestic fowls, but they get some of them when they are small and many of the larger ones. I think the birds have eaten half of those hatched on my farm, but they are getting too large for them (date, June 2, 1875). The farmers will all tell you the birds eat them, but they have killed many of the birds."

First, the destruction of the eggs deposited.—In thickly settled countries, where labor is cheap, and there are large landed estates, as France and Italy, it may be possible to do this somewhat effectually, and it will effect something even in our border States; but when the invasion is general, and the eggs are deposited over a large area, what can the farmers do towards destroying them, not only on the farms, but on the much larger area surrounding them?

The following, from a French newspaper in 1841, will give some idea of the work of collecting grasshoppers in Southern Europe:—"Such immense quantities of grasshoppers have appeared this year in Spain that they threaten in some places to entirely destroy the crops. At Danriel, in the province of Cuidad-Real, three hundred persons are constantly employed to collect these destructive insects, and though they destroy seventy or eighty sacks every day, they do not appear to diminish." This shows the number employed on a limited area. From whence will come a corresponding force for the broad area of our border States?

As a practical test, let us take a county in Kansas, say Rice County, which has an area of 720 square miles, and a population, according to the last report of the Kansas Board of Agriculture, of 2,396, and a voting population of 260 or 275. Suppose eggs to have been deposited generally over this area, what progress could this number of persons have made towards collecting or destroying them during the season? But let us see the condition after the invasion. A correspondent of the board writes:—"Having traveled over the largest portion of our county, I find that about three-fourths of our people are almost entirely destitute of food, fuel, and clothing. Some are now living on boiled wheat, and not half enough of that." And the report adds:—"S. T. Kelsey thinks that 500 persons in Rice County will need assistance." And now we may ask in what condition they were to devote their time in collecting grasshoppers' eggs, when want was staring them in the face. Had a liberal reward been offered by the State or general government, although they might have made but little progress in the work as compared with the amount necessary to be done to be effectual, still it would have done some good, and would have afforded at the same time some relief; and I believe that it is always best, when it can be done, to apply a remedy which will do good in one direction, if it fails in another.

[NOTE.—Since writing the above, many new facts in reference to the history and habits of *C. spretus* have been ascertained, and will be published in the report of the U. S. Entomological Commission; although in correcting proof now (1878), I have preferred to allow what was written in 1875 to remain as it was, that the advance in our knowledge may be shown by comparison.]

Destruction of the larvæ and pupæ.—A number of methods to accomplish this desirable end have been tried and recommended, as rolling the surface in order to crush them, collecting and destroying them in various ways, burning, etc. There is no doubt but each of these methods will effect something, and may well be tried, according to circumstances; and in thickly settled districts, where the larger portion of the land is under cultivation and the force at command comparatively strong, these means, and some others which are hereafter mentioned, may, and probably will, suffice to hold the enemy in check, especially if the farmers maintain their courage and fight the battle bravely and in concert. In thinly populated districts, and even where the larger portion of the land is not cultivated and the force at command is weak, the case is not so hopeful, as the surrounding uncultivated sections will furnish a new supply as rapidly as the previous one is destroyed. Professor Riley informs us that ditching as practiced in Western Missouri appears to be the most effective mode of defense adopted, and he thinks will prove a specific against the young. A ditch of the dimensions he gives—two feet deep and two wide, with sharply perpendicular sides—will doubtless prove an effectual barrier against the young larvæ, but the pupæ, though halting for a time, will soon make the leap, and then the column will press onward. But it must be remembered that it requires time to dig a ditch of these dimensions around an entire farm:

to protect a single field of forty acres requires a mile of ditching, or the removal of nearly 800 cubic yards of earth, which, in most cases, the farmer and his son or single hand will have to do.*

I have noticed the larger irrigating-ditches in Utah, with a water-surface from three to four feet wide, covered with wingless crickets (*Anabrus simplex*), which were floating helplessly onward; but although this was the case, the marching column passed on in its course with comparatively undiminished numbers. And in Utah and Colorado these ditches form but little impediment to the movements of the pupæ of the *C. spretus*. In the cool of the morning, in those mountain regions, the farmers frequently drive the semi-torpid young into the irrigating-ditches, firing straw placed along one side to catch those that leap the ditch. But among the chief agencies in this work of destruction I am disposed to class birds and fowls, and to this end would recommend to the legislatures of the States suffering from these visitations the passage of stringent laws stopping entirely the destruction of all insect-eating birds, not for a portion of the year only, but for the entire year, and offering a premium for the destruction of rapacious birds. Let an officer be appointed in each district, if necessary, composed of four or five counties, whose duty it shall be to see that the laws are enforced, and who shall also experiment in introducing and multiplying the English sparrow or some other insect-eating bird of similar habits. It would be well, also, for the State and county agricultural societies to encourage the increase of domestic fowls as far as possible. Hogs should be raised, as they are not only fond of these insects, and also army-worms, but would also soon learn to hunt for the egg-sacks as they do for acorns in oak-forests.

Driving into traps and ditches are remedies which have long been practiced. Scott in his "Excursions in Ronda and Granada", as quoted by Kirby says:—" During our ride from Cordova to Serville we observed a number of men advancing in skirmishing order across the country and thrashing the ground most savagely with long flails. Curious to know what could be the motive for this Xerxes-like treatment of the earth, we turned out of the road to inspect their operations, and found they were driving a swarm of locusts into a wide piece of linen spread on the ground some distance before them, wherein they were made prisoners." Kirby adds in a note:—" The same plan is adopted for the destruction of these insects in some parts of the United States; *deep trenches being dug at the end of the fields, into which the grasshoppers are driven with branches*, and then destroyed by throwing earth upon them." What has been beneficial heretofore may be so again, and because it is old is no reason for rejecting it for something new until thoroughly tried.

But without discussing further the various methods of defense against the young, which experience and ingenuity, together with some knowledge of the insect, may devise, I must sum up the matter, and, after noticing some Acridian peculiarities of this season, close this note, which is already too extended.

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* Subsequent observations have convinced me that the young locusts can be fought with a good degree of success, and that ditching is practicable and one of the best remedies that can be adopted.

1st. It is impossible to tell what may be done towards preventing their incursions into the border States until their history has been more thoroughly traced. This can only be done through the general government and with the aid of the military posts and stations.

2d. While it would be folly to undertake to exterminate them in their native haunts by destroying the eggs or the insects, yet, if it be possible to induce the Indians by rewards to collect the eggs and young along the west side of the Plains, it would be wise to do so, and would, as a matter of course, do something toward diminishing them and keeping the Indian squaws at least employed, for I doubt exceedingly as to the male Indians doing much in this line, as they are so lazy.

3d. If it is found that the hatching-grounds of the invading swarms are in the areas mentioned heretofore, it would be well for the government to give all its land of that section to induce immigration thereto, and the settlement, irrigation, and cultivation thereof.

4th. When investigation shows the usual hatching-regions, if such there be, and line of travel, signal-stations connected by telegraph lines with the sections subject to invasion may do much good by giving warning of the coming locust storm.

5th. It would be wise for the people of Nebraska and Kansas to rely more upon wheat and root crops, as the hordes usually come too late to injure the former and cannot so greatly injure the latter as other crops. But for the season after the incursion, when the young are expected to hatch, this order will have to be somewhat reversed. This branch of the subject, I think, has not received the attention of the farmers of the border States which it deserves.

6th. It would be well for the States visited to offer rewards for the eggs and young, for although it might do but little towards thinning the ranks of the pests it would do some good in this direction, and would afford a means of subsistence to the unfortunate.

7th. These States should make stringent laws protecting the insect-eating birds, and adopt a method of enforcing them that would be carried out. It will pay them to employ a naturalist to determine those species which should be preserved and those for whose destruction a reward should be offered. In addition to this, farmers should raise an abundance of domestic fowls, which will furnish food as well as assist in destroying the locusts.

8th. It would be well for the farmers to raise more hogs wherever the grounds are protected by fences and they can be allowed to range.

9th. Ditching against the young larvæ, and driving into ditches and fire, and such other local remedies as the situation and means at hand may suggest, should be employed, and the farmer should bravely fight the battle.

Although the resulting brood generally proves more destructive in the mountain regions than the incoming storm, yet this does not appear so far to have been the case in the Mississippi Valley; and as a preventive or remedy for the original hordes dispenses with the necessity of battling with their progeny, it is against these the general government should direct its efforts in an earnest and determined manner.

From what is known of the habits of this species we may be assured that it will never become a permanent resident of the Mississippi Valley, as its sudden transfer from the dry and rarified air of the elevated mountain regions to the heavy and moist atmosphere of the States requires too rapid a change in its nature for it to undergo. But, supposing it should become habituated to this region and overcome all climatic difficulties, it is very probable, in fact I might say almost certain, that it would lose its migratory disposition, and if but a variety of *C. femur-rubrum*, as I strongly suspect, would in all probability revert to that form.

The origin of the migratory habit of this species is an interesting question, and, I am inclined to think, is directly connected with the origin of the treeless plains of those western regions. If, as I have intimated, it is a variety of *C. femur-rubrum*, it is highly probable the latter appeared first in the older districts of the Atlantic area in its present or some earlier form, and gradually extended west, and, as is usual with the group to which it belongs, as it ascended to the colder regions of the Rocky Mountain Range, would have assumed the short-winged form, unless prevented by some compensating cause. The repeated burnings of the prairies may have caused frequent removals, and thus have given origin to its longer wings and migrating disposition. I am aware the question may be asked, Why did not the same thing occur with other species? But if the reader will carefully examine the list and localities of the United States *Acridii*, he will find but few species which belong to both the eastern and western regions; the belt which once formed the water-line north and south through the continent forms a more distinct line between Acridian districts than even the Rocky Mountain Range, as I have shown in a former paper. But this is a question requiring a more thorough investigation than I can give it in this note, even had I the data necessary and felt able to do so with my limited geological knowledge. I therefore simply throw out the thought, to call the attention of others to the subject.

There is another fact presented this season in regard to this group of the *Calopteni*, to which I wish for a moment to call attention.

As shown in my Synopsis, and as confirmed by other entomologists, the chief difference between the *spretus* and *femur-rubrum* is the notch in the last abdominal segment of the male in the former and its absence in the male of the latter species, and the longer wings of the former.

Heretofore, the *femur-rubrum*, as thus marked, has always been our most common species in this section (Southern Illinois), and could, throughout the summer and fall and even during the spring, be found at any time in the fields and along the highways; but, strange to say, this season that form has entirely disappeared, and has been replaced by a rather more slender form, with the last segment distinctly notched and the wings lengthened, resembling, and apparently identical with, Professor Riley's *C. atlanis*. How are we to account for this? It will not do to call it a hybrid between the *spretus* and the *femur-rubrum*, as the former has never been known to visit this region, at least in numbers sufficient to attract attention, the great army last season having penetrated but a short distance into the western side of Missouri. Nor will it do to say my examinations have not been sufficiently thorough, for I have kept watch of them during the entire summer, gathering hundreds, and, although finding some variation, have failed so far to find a single *femur-rubrum*.

I am also informed, by a letter just received from Professor Burril, of the Industrial University at Champaign, in this State, that since he noticed an article I recently published on this subject, he has paid some attention to the matter, and finds the same thing true there. I also observe a note in the last number of the American Naturalist, from Dr. Packard, mentioning the occurrence of *spretus* (probably *atlanis*) in Massachusetts. Also the very fact that Professor Riley last year mentions the intermediate form, which he names as a new species, and which had never before attracted attention, coincides with the other facts I have mentioned. Here, then, beyond dispute, a remarkable change is taking place, which gives rise to a number of important questions. And first of these is, What is the cause of this? I think it is owing chiefly, if not entirely, to climatic influences, and forms an index to the great changes in specific characters which may be effected by a change of climate. If I am correct in this, it follows that when the climate reverts to its normal condition the species will do the same; and, on the contrary, if one should be permanent the other will also, in all probability, be the same.

I may also notice, as bearing upon this point, the fact (for since the publication of my recent article I have ascertained it is a fact) that *Caloptenus differentialis* Thos. has been seen in the central part of this State flying in bodies at considerable height, and apparently migrating.

Acridium emarginatum Uhl., a Western species, never before known to occur east of the Mississippi, has been discovered this season as far east as Bloomington in this State. These facts are certainly important and instructive, and deserve careful consideration.

The chief practical questions connected with this subject, and which more directly concern our agriculturists, are these:—(1) Will invasions of the *C. spretus* grow more and more frequent? (2) Will it continue to extend its limits farther and farther eastward? (3) Will the changes now taking place result in producing migratory hordes in our midst?

To the first of these questions we may answer briefly, the spread of the population has brought these irruptions more into notice than formerly, and from this cause they appear more frequent. But this does not fully account for all the facts, and therefore we must suppose that a succession of similar climatic conditions has caused more frequent migrations; and that with the changes in this respect there will be a corresponding change in the effect. In answer to the other questions, we may state that unless there should be a remarkable permanent change in the climate, we need have no fears of such results.

ART. XXII.—ON THE HEMIPTERA COLLECTED BY DR. ELLIOTT COUES, U. S. A., IN DAKOTA AND MONTANA, DURING 1873-74.*

BY P. R. UHLER.

HETEROPTERA.

CORIMELÆNIDÆ.

CORIMELÆNA, White.

1. *Corimelæna pulicaria.*

Odontoscelis pulicarius, GERMAR, Zeits. vol. i, p. 39, No. 6.

Inhabits Dakota, and is found to be widely distributed throughout Eastern North America, from near Quebec to as far south as Galveston, Tex.

PACHYCORIDÆ.

HOMÆMUS, Dallas.

2. *Homæmus æneifrons.*

Scutellera æneifrons, SAY, Long's Exped. Appendix, p. 229, No. 2.

Obtained near Pembina, Dak., and from the vicinity of Mouse River, August 29, 1873.

Subfamily EURYGASTRINA.

EURYGASTER, Lap.

3. *Eurygaster alternatus.*

Tetyra alternata, SAY, Amer. Entomology, vol. i, p. 43, tab. 3, fig. 3.

Collected from the prairies near Mouse River, August 29, from near Pembina, from Turtle Mount, Dakota, and from the Milk River region in Northern Montana.

CYDNIDÆ.

SEHIRUS, Amyot & Serv.

4. *Sehirus cinctus.*

Pentatoma cincta, PALISOT-BEAUV. Ins. Afr. et Amér. p. 114, pl. 8, fig. 7.
Cydnus lygatus, SAY, Heteropt. p. 10, No. 1.

Found near Pembina, and near Mouse River on August 29, 1873.

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* [See note, p. 481, antea.—ED.]

Subfamily ASOPINA.

PERILLUS, Stål.

5. *Perillus exaptus.*

Pentatoma exapta, SAY, Journ. Acad. Phila. vol. iv, p. 313, No. 3.

Brought from the Milk River region in 1874.

6. *Perillus claudus.*

Pentatoma clauda, SAY, Journ. Acad. Phila. vol. iv, p. 313, No. 3.

Collected near Turtle Mount, July 24, 1873.

PODISUS, Stål.

7. *Podisus cynicus.*

Pentatoma cynica, SAY, Heteropt. p. 3, No. 1.

Inhabits the plains near Pembina, and was obtained also near Mouse River, August 29, 1873, and in the Milk River region.

Subfamily PENTATOMINA.

COSMOPEPLA, Stål.

8. *Cosmopepla carnifex.*

Cimex carnifex, FAB. Ent. Syst. Suppl. p. 535, No. 162.

Collected from near Pembina in June; from Turtle Mount, July 24; and from the Milk River region

CŒNUS, Dallas.

9. *Cœnus delius.*

Pentatoma delia, SAY, Heteropt. p. 8, No. 18.

From the vicinity of Pembina; also from Mouse River region, August 29.

LIODERMA, Uhler.

10. *Lioderma viridicata.*

Lioderma viridicata, UHLER, in Wheeler's Report on Nevada, Utah, &c., p. 830, pl. 42, fig. 11.

Obtained in the Milk River region, Montana.

COREIDÆ.

ALYDUS, Fab.

11. *Alydus eurinus.*

Lygæus eurinus, SAY, Journ. Acad. Philad. vol. iv, p. 324, No. 5.

From Pembina; Turtle Mount, July 24, and from Milk River region.

NEIDES, Latr.

12. *Neides muticus.*

Berytus muticus, SAY, Heteropt. New Harmony, p. 13.

Found in the vicinity of Pembina; date not given.

HARMOSTES, Burm.

13. *Harmostes reflexulus.*

Syromastes reflexulus, SAY, Heteropt. p. 10, No. 1.

From near Mouse River, August 29.

CORIZUS, Fallen.

14. *Corizus lateralis.*

Coreus lateralis, SAY, Journ. Acad. Philad. vol. iv, p. 320, No. 4.
Corizus lateralis, SIGNORET, Ann, Soc. Ent. France, sér. 3, vol. vii, p. 97, No. 36.

Brought from Turtle Mount, July 23.

15. *Corizus punctiventris.*

Corizus punctiventris, DALLAS, Brit. Mus. List Hemipt. vol. ii, p. 523, No. 3.
Corizus borealis, UHLER, Proceed. Acad. Philad. 1861, p. 284.

Found in the vicinity of Pembina in June.

LYGÆIDÆ.

LYGÆUS, Fab.

16. *Lygæus reclivatus.*

Lygæus reclivatus, SAY, Journ. Acad. Philad. vol. iv, p. 321.

The presence of moisture in the soil, together with suitable shelter, may be necessary for the growth of *Asclepias*, upon which this species lives. Although the expedition of 1873 traversed the Plains at the right season for obtaining this insect, no specimens were secured; and as the sweeping-net was constantly employed, it would certainly have been captured if present. Not until the Milk River region was reached (the next year) did specimens occur to the collector, and only then in small numbers.

GEOCORIS.

17. *Geocoris bullata.*

Salda bullata, SAY, Heteropt. New Harmony, p. 18, No. 2.

Obtained near Pembina in 1873.

NYSIUS, Dallas.

18. *Nysius angustatus.*

Nysius angustatus, UHLER, Hayden's Survey of Montana, p. 406, No. 2.

From Pembina, and from near Mouse River, August 29.

TRAPEZONOTUS.

19. *Trapezonotus nebulosus.*

Lygæus nebulosus, FALLEN, Monog. Cim. p. 65, No. 7.
Pamera fallax, SAY, Heteropt. p. 17, No. 6.

Two specimens were captured in the Milk River country.

PHYTOCORIDÆ.

TRIGONOTYLUS, Fieb.

20. *Trigonotylus ruficornis.*

Miris ruficornis, FALLEN, Hemipt. Suec. vol. i, p. 133.
Trigonotylus ruficornis, FIEBER, Europ. Hemipt. p. 243.

From Pembina, June 29 and July 1.

MIRIS, Fieber.

21. *Miris instabilis.*

Miris instabilis, UHLER, Hayden's Survey, Bulletin, vol. ii, pt. v, p. 50.

Obtained in the vicinity of Pembina, July 1.

LOPIDEA, Uhler.

22. *Lopidea media.*

Capsus medius, SAY, Heteropt. p. 22, No. 11.

Found near Pembina in the vicinity of Mouse River, August 29, and in the Milk River region.

LYGUS, Hahn.

23. *Lygus invitus.*

Capsus invitus, SAY, Heteropt. p. 24, No. 21.

Captured near Pembina, June 19, and near Turtle Mount, July 24.

As this species inhabits the blossoms of the wild grapes in the Atlantic region and Mississippi Valley, does it not occur on some other plant in that northern region from which it has now been brought?

24. *Lygus lineolaris.*

Capsus lineolaris, PALISOT-BEAUV. Ins. Afr. et Amér. p. 187, pl. xi, fig. 7.

Inhabits Pembina; Turtle Mount, July 22; Mouse River region, August 29; and Milk River region.

25. *Lygus lineatus.*

Lygæus lineatus, FAB. Entom. Syst. Suppl. p. 541, No. 324; Syst. Rhyng. p. 234, No. 152.
Capsus 4-vitattus, SAY, Heteropt. p. 20, No. 5.

Appears to be common in many parts of the Northwest, on the eastern side of the Rocky Mountains. The present specimens were collected near Pembina, July 1 to 15.

26. *Lygus dislocatus.*

Capsus dislocatus, SAY, Heteropt. p. 21, No. 6.

One specimen of the red variety was obtained at Pembina, June 29.

CALOCORIS, Fieb.

27. *Calocaris rapidus.*

Capsus rapidus, SAY, Heteropt. p. 20, No. 4.

Collected in the vicinity of Turtle Mount, July 24.

RESTHENIA, Amyot & Serv.

28. *Resthenia insignis.*

Capsus insignis, SAY, Heteropt. p. 22, No. 12.

From Turtle Mount, July 24.

PŒCILOSCYTUS, Fieb.

29. *Pœciloscytus unifasciatus.*

Lygæus unifasciatus, FAB. Entom. Syst. vol. iv, p. 187, No. 153.
Pœciloscytus unifasciatus, FIEB. Eur. Hem. p. 276, No. 1.

A common European species, which extends eastwardly through Northern Asia, and on the western side of North America is found from Alaska, the Yukon River, and Mackenzie River regions as far south as the Red River of Minnesota.

The specimens in this collection were procured near Pembina in June.

STIPHROSOMA, Fieb.

30. *Stiphrosoma stygica.*

Capsus stygicus, SAY, Heteropt. p. 24, No. 18.

Found at Pembina, June 14.

In Maryland, it occurs near the beaches in the tide-water districts and on the sea-coast, living upon the twigs and leaves of *Baccharis halimifolia.* It would be interesting to know if this neat shrub affects saline sands in the Northwest and West, in places which may have been the margins of salt lakes and beaches of ancient ocean estuaries. This is a most adroit little insect, dodging with rapidity behind the stem or leat the moment it is approached; but, if hard-pressed, it drops to the ground, generally into the grass, and then prepares to fly off to the next bush of its native shrub.

MALACOCORIS, FIEB.

31. *Malacocoris irroratus.*

Capsus irroratus, SAY, Heteropt. p. 25, No. 23.

From Pembina, June 19 and July 1, and Turtle Mount, July 24.

PHYMATIDÆ.

PHYMATA, Lat.

32. *Phymata erosa.*

Cimex erosus, LINN. Syst. Nat. ed. 12, vol. ii, p. 718, No. 19.
Phymata erosa, AMYOT & SERV. Hémipt. p. 290, No. 2.

Obtained near Pembina in June, and near Mouse River, August 29.

NABIDÆ.

CORISCUS, Schrank.

33. *Coriscus subcoleoptratus.*

Nabicula subcoleoptrata, KIRBY, Fauna Bor.-Amer. vol. iv, p. 282.
Nabis subcoleoptratus, REUTER, Öfversigt Vetensk. Akad. Förhandl. 1872, p. 81, No. 1.

From Pembina, July; from Turtle Mount, July 24; and from Milk River region.

34. *Coriscus ferus.*

Cimex ferus, LINN. Fauna Suecicæ, p. 256, No. 962.
Nabis ferus, FIEB. Eur. Hémipt. p. 161, No. 9.

Inhabits Pembina; was collected June 19; near Mouse River, August 29; and Milk River region.

Subfamily REDUVIINA.

SINEA, Amyot & Serv.

35. *Sinea diadema.*

Reduvius diadema, FAB. Gen. Ins. p. 302; Ent. Syst. iv, p. 206, No. 46.
Sinea multispinosa, AMYOT & SERV. Hémipt. p. 375, No. 1.

Obtained at Pembina and at Turtle Mount, July 24. It is distributed over a large part of North America, from Mexico into Canada, and throughout the Atlantic region.

Subfamily APIOMERINA.

APIOMERUS, Hahn.

36. *Apiomerus ventralis.*

Reduvius ventralis, SAY, Heteropt. p. 31, No. 2.

One specimen from the vicinity of Pembina.

HYGROMETRIDÆ.

LIMNOTRECHUS, Stål.

37. *Limnotrechus marginatus.*

Gerris marginatus, SAY, Heteropt. p. 36, No. 2.

Inhabits the Milk River region, and is quite common in the Atlantic district in most of its areas.

LIMNOPORUS, Stål.

38. *Limnoporus rufoscutellatus.*

Gerris rufoscutellata, LAT. Gen. Ins. iii, p. 134, No. 2.—SCHUMMEL, Ploteres, tab. 3, figs. 1, 2.

Occurs at Pembina, on the pools and ponds.

NOTONECTIDÆ.

NOTONECTA, Linn.

39. *Notonecta insulata.*

Notonecta insulata, KIRBY, Fauna Bor.-Amer. iv, p. 285, No. 399.

Collected in the Milk River region.

40. *Notonecta undulata.*

Notonecta undulata, SAY, Heteropt. p. 39, No. 1.

Also collected in the Milk River region.

CORISIDÆ.

CORISA, Geoff.

41. *Corisa sutilis.*

Corixa sutilis, UHLER, Bulletin of U. S. Geog. Survey of the Territories, vol. ii, No. 5, p. 73, No. 1.

Inhabits standing water in the Milk River region.

42. *Corisa interrupta.*

Corixa interrupta, SAY, Journ. Acad. Philad. vol. iv, p. 328, No. 1.

Obtained in the vicinity of the Milk River, Montana.

43. *Corisa vulnerata.*

Corixa vulnerata, UHLER, Proc. Acad. Nat. Sci. Philad. 1861, p. 284.

Also from the Milk River region.

HOMOPTERA.

MEMBRACIDÆ.

CERESA, Fairm.

44. *Ceresa bubalus.*

Membracis bubalus, FAB. Ent. Syst. vol. iv, p. 14.

From Pembina, from the Milk River region, and from near Mouse River.

45. *Ceresa diceros.*

Membracis diceros, SAY, Long's Exped. Appendix, p. 299.

From the Mouse River region, August 17.

STICTOCEPHALA, Stål.

46. *Stictocephala inermis.*

Membracis inermis, FAB. Ent. Syst. vol. iv, No. 15.

Found near Pembina, at Turtle Mount, July 24, and near Mouse River, August 17–29.

THELIA, Amyot & Serv.

47. *Thelia univittata.*

Membracis univittata, HARRIS, Ins. Injur. to Veg. p. 221.

From Turtle Mount, July 23 and 24.

FULGORIDÆ.

SCOLOPS, Germ.

48. *Scolops sulcipes.*

Fulgora sulcipes, SAY, Journ. Acad. Philad. vol. iv, p. 335.

From Mouse River region, August 17–29.

LIBURNIA, Stål.

49. *Liburnia vittatifrons.*

Liburnia vittatifrons, UHLER, Hayden's U. S. Geol. Surv. of the Territ. Bulletins, vol. ii, No. 5, p. 85.

Collected on the plains of Montana.

CERCOPIDÆ.

APHROPHORA, Germ.

50. *Aphrophora quadrinotata.*

Aphrophora quadrinotata, SAY, Journ. Acad. Philad. vol. vi, p. 304, No. 2.

Obtained at Turtle Mount, July 24.

PHILÆNUS, Stål.

51. *Philænus lineatus.*

Cicada lineata, LINN. Syst. Nat. (ed. 12), p. 709, No. 31.

Collected near Pembina, June 19–29; Turtle Mount, July 23; and in the vicinity of Milk River.

TETTIGONIDÆ.

PROCONIA, St. Farg. & Serv.

52. *Proconia costalis.*

Tettigonia costalis, FAB. Ent. Syst. Suppl. 516, Nos. 22–23.

Obtained at Pembina, June 29; at Turtle Mount, July 24; and near Mouse River, August 17–29.

TETTIGONIA, Geoff.

53. *Tettigonia hieroglyphica.*

Tettigonia hieroglyphica, SAY, Journ. Acad. Philad. vol. vi, p. 313, No. 6.

Inhabits Pembina, found on June 19, and at Turtle Mount, July 24.

GYPONA, Germ.

54. *Gypona octolineata.*

Tettigonia octolineata, SAY, Journ. Acad. Philad. vol. iv, p. 340, No. 1.

Collected from the vicinity of Mouse River, August 17–29.

Subfamily JASSINA.

JASSUS, Auctor.

55. *Jassus irroratus.*

Jassus irroratus, SAY, Journ. Acad. Philad. vol. vi, p. 308, No. 7.

Collected in the vicinity of Pembina, June 19.

56. *Jassus unicolor.*

Bythoscopus unicolor, FITCH, Cat. N. Y. State Cabinet, p. 58, No. 2.

Obtained at Turtle Mount, July 24, and at Pembina in June.

57. *Jassus twiningi*, n. sp.

Yellow or greenish, moderately robust, form similar to that of *J. irroratus*, Say, with the head not angular in front, but regularly lunate and sharp-edged, with the cranium flat, bright yellow. Face and beneath pale testaceous, or clear yellow. Pronotum pale russet-brown, with a medial straight line, two oblique lines, and a spot each side posteriorly bluish; at the anterior and outer angles a yellow spot, which runs down on the side. Scutellum pale on the disk, tinged with orange each side of tip, and with a larger spot at each basal angle. Hemelytra pale ochreous, tinged with russet, with white spots in the cells of the clavus and in some of those near the tip of the corium; the apex with a brown cloud; an oblique, brown band runs outwards and forwards from the tip of the clavus, but stops before reaching the costal margin; apex of the clavus dark brown, with the extreme tip minutely white; nervures pale, some of the cross-nervules of the costal margin, particularly at tip, terminating in a minute black dot, the ante-apical cross-nervule of the valvular portion of the tip dark brown. Legs pale testaceous. Abdomen chrome-yellow, with the incisures black.

Length to tip of venter 5^{mm}; width of pronotum 2^{mm}.

Only females have been examined.

The wing-covers are a little longer than the abdomen, and slightly valvular at tip on the inner side.

Obtained at Turtle Mount, July 24, and at Pembina in June.

Named in honor of Major W. J. Twining, Corps of Engineers, U. S. A.

Two other species of *Jassus* are in the lot from Pembina, but they are too much altered to admit of description.

DELTOCEPHALUS, Burm.

58. *Deltocephalus sayi.*

Amblycephalus sayii, FITCH, Catal. N. Y. State Cabinet, p. 61, No. 2.

Collected in the vicinity of Pembina.

59. *Deltocephalus configuratus*, n. sp.

Robust, pale yellowish-testaceous, polished, inscribed with brown, white and black. Face faintly brownish each side, with a series of graduated, wavy, transverse lines each side of front, and on the middle is a longitudinal straight line; vertex bluntly triangular, its apex white, and bounded inferiorly by a brown, minute, arcuated line; the edge white, bluntly rounded; cranium with a broad and long brown line each side, which tapers anteriorly, invaded in front by a slender band and by a broader oblique line each side posteriorly, both white; the broad lateral and the central depressed line also white; clypeus white, the rostrum dull ochreous, tipped with piceous. Pronotum white, with six brown lines, of which the two middle ones are broader and longer, and between them are two very dark brown points; beneath the posterior angle of the eye is a spot, and on the side of the pronotum, as well as on its lower margin, is a brown line; cheeks with a large brown spot and minute specks in the darker specimens. Pleura blackish, the segments margined with testaceous or yellow. Scutellum faintly embrowned (♀), suffused with yellow (♂), and marked with a brown spot each side of base, with a smaller spot each side of the middle, and with a submarginal line each side of tip. Corium translucent, pale testaceous, margined all around with white, the nervures white, and the areoles of the disk and tip margined with fuscous; four apical areoles, which are large and angular. Wings milky-white, a little nebulous exteriorly towards the tip. Legs yellowish, the femora banded and the posterior pair streaked with brown; the tibiæ with longitudinal series of brown dots; apical two-thirds of the tarsi piceous. Abdomen black, the fore and hind margins of the segments, and usually two or three of the posterior segments testaceous; connexivum margined more or less greenish-yellow. Last ventral segment of the female triangularly lobed on the middle of the hind margin, and emarginated each side of the lobe. Inferior genital covers long, suboval posteriorly, the margin situated inferiorly and with a short groove; at the upper angle is a pencil of stiff bristles; the sheath supporting the penis is shovel-shaped, beset with bristles, a little sinuated each side, where also a long stylet projects backwards. Length to tip of abdomen (♂) 4^{mm}, (♀) 5^{mm}. Width of pronotum 1.5^{mm}.

The female is paler than the male, and has less fuscous on the hemelytra. In both sexes, the hemelytra are shorter than the abdomen.

Collected in the Milk River region in Northern Montana.

A species of *Psylla* is in the collection from the vicinity of Pembina, but it is too much altered to admit of description.

ART. XXIII.—ON THE LEPIDOPTERA COLLECTED BY DR. ELLIOTT COUES, U. S. A., IN MONTANA, DURING 1874.*

BY W. H. EDWARDS.

The butterflies were few in number, but embrace some interesting species, and at least two that are new. They were taken at various points on the forty-ninth parallel, in Montana, between 26th July and 26th August, a season of the year not favorable to collecting these insects, being too late for the early broods and too early for the autumnal.

PAPILIONIDÆ.

1. *Pieris protodice*, Boisduval.
2. *Pieris occidentalis*, Reakirt.

A few specimens were taken early in August at the point of crossing Milk River and beyond. *P. protodice* ranges over the continent from New York to California, and on the western coast is found in British Columbia. It is, however, much more abundant to the eastward, and in the Ohio Valley is extremely common in the months of August and September. So far as appears, it is single-brooded, and passes the winter in chrysalis. The larvæ feed upon cabbage, horse-radish, and allied plants.

P. occidentalis is a Western species, not known this side of the Rocky Mountains, but ranging from Colorado to the Pacific. It may be distinguished from *protodice* by the more rounded hind margins of primaries, and by the arrangement of the curved band of black patches on the discs of the same wings, there being a patch near the inner margin which completes the band. The under side is paler and more yellow-dusted than is the other species.

3. *Colias keewaydin*, Edwards.

This species occupies the same territory with the larger and deeper-colored orange species, *C. eurytheme*, Boisduval, and may perhaps yet prove by breeding from the egg to be a variety of that; but, till so proved, it is sufficiently distinct to warrant its being regarded as a true species. These orange *Coliades* are found from Illinois to the Pacific and as far south as Arizona. Their larvæ feed on buffalo-grass and species of clover, and that of *Colias eurytheme* so closely resembles the larva of *C. philodice*, the common species of the Eastern States, that it can scarcely be distinguished from it.

[*See note, p. 481, *antea*.—ED.]

4. *Colias eriphyle*, Edw., (new species).

From Milk River. This species much resembles *philodice* in color, but is paler and of smaller average size. The marginal fuscous borders are pale-colored, and are cut to the edge of the wing by the yellow nervules, and the inner side of these borders is almost always crenated. The discal spot on the upper side of the fore wings is small, oval, and black, of hind wings is orange, single, and almost always deep orange; on the under side, the surface of the hind wings and the costal margin of fore wings is largely dusted with fine brown scales; the discal spot of the fore wings has a yellow central streak, and that of the hind wings is single (with an occasional exception), small, either white or roseate, in a ferruginous ring. Most often the surface of both wings, apart from the discal spots, is immaculate, showing no trace of submarginal brown points or spot at outer angle of hind wings.

I first received examples of this species from Mr. T. L. Mead, who took them in Colorado, in 1871, and was disposed to regard them as a variety of *philodice*. Subsequently I received about 50 specimens, taken by the late G. R. Crotch, in British Columbia, and later, 1874, several specimens, which were taken by Mr. Pywell on the line of the Northern Pacific Railroad west of Bismarck. This material enables me to judge with confidence of the distinctness of this species. It is not, in my opinion, a variety of *philodice*, nor is it *occidentalis*, Scudder, to which it bears some resemblance.

No other *Papilionidæ* were collected by the expedition, though no doubt several of the large *Papilios—eurymedon*, *daunus*, and *rutulus*—should, at the proper season, be found in that latitude. So the *Coliades*, *scudderi* and *alexandra*, should be common throughout that part of the mountains, and the ochraceous species *astræa*, of which two or three specimens only have as yet been brought to notice, collected by the Expedition of Dr. Hayden on the Yellowstone.

DANAIDÆ.

5. *Danais archippus*.

This species inhabits the entire continent below the sub-boreal regions, and has even reached the Sandwich Islands. It is large-bodied and strong of wing, and its larvæ finding a food-plant in any species of milkweed (*Asclepias*) the butterfly has penetrated every district in which these plants grow.

NYMPHALIDÆ.

6. *Argynnis edwardsi*, Reakirt.

This large and beautiful species was taken on Chief Mountain, August 15. It ranges from Colorado to Montana, and appears to be confined to the mountains. It may be known by its large size, by the long and pointed fore wings, and by the great size of the silver spots that ornament its under side. The ground-color of this side in both sexes is of an olive-green, and forms a good distinctive character.

7. *Argynnis nevadensis*, Edwards.

This butterfly was taken near Three Buttes, August 8. It is allied to *edwardsi* in shape, and forms a subgroup with it. It is brighter-colored, smaller-sized, and beneath the ground-color is yellow or buff, mottled in the male with pale olive-green, and in the female with darker buff. The species ranges from Nevada northward, and is confined to the mountains.

8. *Argynnis clio*, Edw., (new species).

A female was taken at Chief Mountain, August 21. The male was known to me from a specimen formerly taken by Dr. Hayden's Montana Expedition. Both sexes expand two inches, and resemble *eurynome*, Edw., in size and shape. The black markings of upper side are less sharply defined, nearly all of them having a rough edging. On the under side, the spots which in most species of *Argynnis* are silver are here buff. with no trace of silver.

9. *Argynnis rhodope*, Edwards.

A single female was taken, August 8, near Three Buttes, and is the first instance which has come to my knowledge of the appearance of this species within the United States. The only examples hitherto taken have come from Cariboo, British Columbia.

The *Argynnides* comprise a very large proportion of the species of butterflies of the United States and British America, more than forty having been described. Of these, the larger part inhabit the Rocky Mountains and the districts beyond to the Pacific. They are mostly local in their habits, and are confined to the valleys and lower slopes of the mountains, alighting on flowers. The larvæ so far as known feed upon different species of violet, and the larger species are single-brooded, hibernating in the larval state.

10. *Phyciodes marcia*, Edwards.

A single specimen, collected at Milk River, July 25. This species is allied to *Tharos*, and may yet be found dimorphic with it. The two range over the whole of the region east of the Rocky Mountains, and have been taken also in Colorado. To the westward they are replaced by *campestris*, *myllitta*, and other allied species, though to the northwest *Tharos* has been taken quite at the Pacific—in British Columbia. It is also found on the Mackenzie River. These small butterflies are common on the Plains, and in cultivated districts frequent meadows.

VANESSIDÆ.

11. *Vanessa antiopa*, Linnæus.

12. *Pyrameis cardui*, Linnæus.

These two species inhabit the entire continent, and the Old World as well, the boreal regions excepted. I have received *antiopa* from the

Yukon River, and from various parts of British America. *P. cardui* has its range more to the southward, and abounds in Arizona and New Mexico, where *antiopa* is but occasional. The larvæ of both species are gregarious, these of *antiopa* feeding on willow, of *cardui* principally on thistle.

13. *Aglais milberti*, Godart.

A few specimens of this were taken at Chief Mountain, August 22. The species ranges eastward to the Atlantic, but is nowhere common. In Colorado, Mr. Mead found it abundant, and saw large numbers of the larvæ, which are gregarious and feed on willow. Probably this species is more abundant in the Rocky Mountains than elsewhere. I have not received it from States to the south of Colorado, but in British America it is found as far north as Fort Simpson on the Mackenzie River.

No other Vanessans were taken, but doubtless *j-album* and *huntera* are also common on the forty-ninth parallel. *Grapta faunus* and *progne* may also be found, and perhaps *zephyrus* and *satyrus*.

No species of *Limenitis* were taken, though doubtless one or more species would have been abundant earlier in the season; *arthemis*, and its supposed dimorphic variety *proserpina*, and *weidemeyeri*, the latter ranging over the mountains from Arizona to Montana, and *arthemis* to the northward as far as Fort Simpson.

SATYRIDÆ.

14. *Cœnonympha ochracea*, Edwards.

15. *Cœnonympha inornata*, Edwards.

The former light ochre-yellow, the other dark brown, changing to umber. Several specimens from different localities were taken. These are small butterflies, expanding about one inch, and inhabit the Plains, their larvæ feeding on the blades of grasses. Species of this genus abound in all the valleys of the Rocky Mountains, and to the westward as far as the Pacific, but to the eastward are unknown.

16. *Satyrus boöpis*, Behr.

Chief Mountain, July 21. Represented by a single specimen. This species belongs rather to Oregon and British Columbia, being apparently very rarely found in the Rocky Mountains. I have not seen it from Colorado, and but once or twice in Dr. Hayden's collections from Montana. It is one of our largest species, size of *alope*, and is without the yellow band in fore wings seen in that species, and usually has no ocelli on the under side of the hind wings.

17. *Satyrus charon*, Edwards.

A few specimens were taken at Frenchman's River and Chief Mountain. This is a small, black species, first noticed by Mr. Mead in Colorado, where it is common, and afterward by Dr. Hayden in Montana, and seems to be limited to the mountains in its range.

The larger *Satyridæ* frequent open forests as well as grassy plains, their larvæ living on the grasses.

LYCÆNIDÆ.

18. *Thecla mopsus*, Boisduval.

This genus was represented by a single specimen of *mopsus*, a species which is spread over the northern parts of the continent, and on the Atlantic as far south as Georgia.

19. *Chrysophanus rubidus*, Edwards.

A single specimen was taken near Three Buttes, August 8. The species seems limited to Montana and westward to Oregon. Dr. Hayden has sent an occasional specimen from Montana. It is of a fiery copper color, and forms one of a group of three, the others being *sirius* from Colorado and *cupreus* from Oregon.

20. *Lycæna melissa*, Edwards.

A number of specimens were taken at several localities. The species ranges from Arizona to British America.

No other *Lycænidæ* were taken, though doubtless *Lycæna* is numerously represented on the forty-ninth parallel, and of *Thecla* and *Chrysophanus* three or four species of each should be common. These insects likewise inhabit grassy plains and slopes, and the Theclas open forests.

HESPERIDÆ.

21. *Pyrgus tessellata*, Scudder.

A species spread over the greater part of the continent, usually known as *sileus*.

22. *Pamphila colorado*, Scudder.

Allied to *comma* of Europe, and common throughout the Rocky Mountains.

The *Hesperidæ* are very numerously represented in the United States, and comprise nearly one-fourth of all the species of diurnal *Lepidoptera* within our limits. From the Rocky Mountains and west to the Pacific, the species are much less numerous than in the eastern and southern districts.

ART. XXIV.—AN ACCOUNT OF SOME INSECTS OF UNUSUAL INTEREST FROM THE TERTIARY ROCKS OF COLORADO AND WYOMING.

BY SAMUEL H. SCUDDER.

An examination of an extensive series of fossil insects recently obtained in different parts of the Rocky Mountain region has brought to light a large number of remarkable forms. To illustrate this, and as an indication of what we may expect further researches will reveal, I have brought together in this paper a few examples from different orders. These, however, are some of the most striking. It will scarcely fail of remark that those which come from the Florissant beds indicate a tropical relationship to a conspicuous degree. Perhaps this selection may show it to a far greater extent than a more systematic one would do; but my studies are constantly revealing similar affinities, leaving no doubt in my mind that the faunal elements of Tropical America of to-day entered largely into the insect-life of the central United States in Tertiary times. Similar tropical characteristics have already appeared in other Tertiary insects I have examined, such as in the *Orthoptera* previously described from Florissant, the *Entimus*, the *Aphana*, and perhaps the *Cyttaromyia* from White River, and possibly also the *Lithortalis* from British Columbia.

The beetle described below (*Parolamia rudis*), however, is of an Old World rather than a New World type.

Perhaps the most generally interesting insect will be thought to be the fossil butterfly (*Prodryas persephone*), which is so perfect as to allow description of the scales, and, besides being the first found in America, is far finer than any of the nine specimens which have been discovered in Europe, and shows, moreover, some features betokening its antiquity.

The fly (*Palembolus florigerus*) is interesting, not only as representing a highly specialized type hitherto unknown on this continent, but as showing how the semblance of an original vein may be formed in the wings out of mere fragments of distinct veins, affording, indeed, a better example of this feature than living members of the same group in other parts of the world.

The insects from other places than Florissant are described on account of their remarkable character. The eggs of the *Corydalites* are, so far as I know, the first insect-eggs that have been found in a fossil state; but aside from that, they have an intrinsic interest. The *Dysagrion* from Green River is of a marked tropical type; while the cases of the caddis-fly enable me to draw the attention of collectors to the occurrence of such objects in a fossil condition.

LEPIDOPTERA: PRODRYAS (πρώ, δρύας).

A stout-bodied, strong-winged genus of *Præfecti*. Eyes moderately large. Antennæ remarkably short, scarcely longer than the head and thorax together, the club moderately long, obovate or subfusiform, about twice as stout as the stalk, about five times as long as broad, broadly and regularly rounded at the tip, and composed of eleven or twelve joints of nearly equal length. Palpi extending beyond the front of the head by a little more than the length of the apical joint; the latter about five times as long as broad, equal, cylindrical, broadly rounded at the tip, and uniformly clothed with slender scales; the middle joint appears to be moderately slender and compressed, twice as broad as the apical joint.

The thorax is stout, with the general form of the *Præfecti*, and particularly of the special group to which *Vanessa* and *Hypanartia* belong. The median ridge of the mesothorax has a minutely impressed line posteriorly; the scutellum is pretty large, lozenge-shaped, slightly broader than long; the metathoracic epimera are pretty large, and taper apically at the median line of the thorax to a blunt point. The legs are too imperfectly seen through the wings to give even the length of any part or of the whole of any one with probability. Posterior lobe of patagia about twice as long as its mean breadth, curving outward and tapering regularly and rapidly to a somewhat produced outer apical angle.

Fore wings nearly twice as long as broad, unusually triangular, the costal margin almost exactly straight, but bent with a posterior curve at the extremity, and slightly convex at the extreme base; the outer margin is also nearly straight on either of its two halves, separated by a slight bend at the extremity of the upper median nervule, the lower half faintly convex; the inner margin is straight, the outer angle only a little rounded. The costal nervule terminates at the middle of the wing. The first superior subcostal nervule originates shortly before the origin of the first inferior subcostal nervule, and terminates scarcely beyond the middle of the third quarter of the wing; the second superior and second inferior subcostal nervules originate in the middle of the wing, the latter from the first inferior branch, as far beyond its base as the first superior nervule before it; the former terminates at the middle of the outer half of the costal border; the latter diverges from the first inferior branch so slightly as to be nearly continuous with its basal portion; the third superior branch originates as far beyond the second as the second beyond the first, and the fourth midway between the third and the outer margin; the latter is widely parted from the main vein, and strikes the costal margin as far beyond the obtuse but distinctly angled apex of the wing as the main branch passes below it. The cell is open. The first median branch originates midway between the base and the final forks, and the latter diverge very slightly at base, leaving a very open and broad subcosto-median interspace.

Hind wings shaped somewhat as in *Hypanartia*, the costal border beyond the great rounded prominence of the extreme base being very gently convex, the outer margin full on the upper half, the upper outer angle broadly rounded; the upper median nervule is developed in the middle of the wing into a long, slender, tapering tail, and the lower half of the wing is strongly crenulate, and especially roundly excised in the lower median interspace and lobed on the lowest median nervule; the lower outer angle is well rounded; the inner margin plainly forms a gutter for the reception of the abdomen. The costal and precostal veins are very doubtful, being exceedingly obscure on the specimen; but the former apparently arises from the common stem of the costal and subcostal veins at right angles to it shortly beyond the base, and then curves strongly outward subparallel to the costal margin, striking the latter in the middle of its apical half; while the precostal is a simple recurved vein, directed inward and forward at the sharpest point of the costal curve. The subcostal vein is peculiar in that its first branch, originating only a little beyond the costal, approximates so closely to the costal margin as to strike scarcely outside of the upper outer angle of the wing, a place usually reserved for the apex of the costal vein; the subcostal forks again, scarcely more than one-quarter way from the base of its first branch to the margin, the middle branch continuing the curve of the main stem, and the lower branch diverging very gradually from it, and widely distant from the median vein. The main stem of the latter, with its upper branch, forms a gentle sinuous curve scarcely approaching the subcostal vein (the cell being open), and emits its first branch in the middle of the cell, or scarcely more than half-way from the base to its final divarication. This latter is unusually slight, the middle branch keeping throughout very close to the upper and distant from the lower branch. The submedian strikes the angle of the wing as far from the lower branch as it is from the middle branch of the median. The internal nervule cannot be determined.

The abdomen is full, with the third and fourth joints longest, the whole nearly twice as long, and in the middle fully as broad as the thorax.

This is the first butterfly that has been found fossil in America, and as only nine species are known from the well-worked Tertiary strata of Europe, it may properly be esteemed an especial rarity. Besides this it has a double value: first, in that it is far more perfect than any of the European specimens (nearly all of which I have seen); and, second, in presenting, as none of the others do to any conspicuous degree, a marked divergence from living types, combined with some characters of an inferior organization. When first received, the tails of the hind wings and the tips of the antennæ were hidden by flakes of stone, and it was taken, both by myself and by every entomologist to whom I showed it, to be a Hesperian, the lowest family of butterflies. The neuration, however, which, although mostly very obscure, can be determined with certainty, shows it to be a Nymphalid, the highest family, with which the structure of the antennæ and palpi and the outline of the hind wings, now entirely uncovered, perfectly agree. The first inference was drawn principally from the robustness of the body and the form, proportions, and markings of the front wings. The latter are unusually long for a Nymphalid of this type, have a remarkably straight costa, an outer border bent at the middle instead of far above it, and are possessed of a nearly transverse, median, light-colored belt on a dark ground, a subapical row of small spots depending from the costa, a spot in continuity with them in the upper median interspace, and beyond them, parallel to the outer border, in the costo-subcostal interspace, a pair of minute spots,—all characters perfectly consonant with Hesperian affinities; never combined, and each very rare in the *Nymphales*. It is not a little strange, however, that while the form and markings of the fore wings are hesperidiform, those of the hind wings are decidedly nymphalidiform. That the exact opposite should be a far more probable occurrence, follows as an assumption from the fact that, as a general rule, the front wings only of the lower *Lepidoptera* are ornamented, and that therefore the ornamentation of the hind wings is a more recent development. The somewhat variegated markings of the hind wings are indeed similar to what we find in certain *Urbicolæ*, such as *Pythonides*, but they are far more common in *Nymphales*, while the wing-contour is of a high nymphalideous type, quite above anything we ever find in *Urbicolæ*.

I am at a loss to suggest any really plausible explanation of the mode of development through which the hind wing should have attained an ornamentation consistent with its organization, while the ornamentation of the fore wings, whose structural framework has kept pace with that of the hind wings, has not advanced a single step beyond a type common to the lowest family of butterflies. It may, however, be suggested as a mere speculation that the position in which the wings of many *Urbicolæ* are held in repose (the front wings oblique or suberect, while the hind wings are horizontal, and therefore more fully exposed to view) might be productive of such a result. In this case, we should anticipate further indications of such a feature, at least in fossil forms. We are acquainted with the upper surface-markings of both pairs of wings in extinct butterflies only in *Neorinopis sepulta* (Boisd.) Butl. and *Thaites ruminiana* Heer. It had escaped notice in my original study of these,* that when they are compared with living types, indications appear of precisely the same nature, although by no means so conspicuous. The rude patches of color that mark the discoidal area of the front wings of *N. sepulta*, and the repetition of almost similar, unbroken, transverse bars on the same portion of the front wings of *T. ruminiana*, when compared with these parts in their nearest living allies, are clearly indications of an inferior as well as an earlier type, while no such contrast is presented in the delicate shading and more complicated pattern of the hind wings. But, again, a partial comparison may be made with the markings of the front wing alone, and in the seven other species of described fossil butterflies there is not one, with the possible exception of *Eugonia atava** (Heer) Scudd., in which the markings may be looked upon as less highly developed than in the living types.

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* Mem. Amer. Assoc. Adv. Sc. i, 1875.

Instances could, of course, be easily given from among living types in which the ornamentation of the upper surface is less variegated in the fore wings than in the hind pair, but it might readily be doubted whether this should be looked upon as having any direct bearing upon this subject; yet, even if none could be cited, it may fairly be urged that the lapse of time since the Florissant beds were deposited is amply sufficient for the loss of any such indication of hesperidiform affinities in a group of insects so pliable in ornamentation as butterflies are shown to be by the mere facts of mimicry.

Prodryas shows further peculiarities when compared with its nearest living allies. In the Tropical American genus *Hypanartia*, which seems to be its nearest neighbor, as in all those closely allied to it at the present day, the costal margin beyond the base is uniformly arched throughout; and the outer margin, angulated in the upper half of the wing, is roundly excised below it, giving these butterflies the common name of "angle wings". They are insects of strong and rapid flight, capable of the most abrupt and unanticipated movements, making them very difficult of capture on the wing. The straight, strong costa and more elongated wing of *Prodryas*, on the other hand, with its nearly uniform straight, outer border, combined with the robustness of the body, indicate great strength of wing and a rapid direct flight, as in the *Hesperides*, but not the power of sudden turning.

In *Hypanartia* and its immediate allies, the cell of the front wing is closed, although by a feeble vein, and the superior subcostal nervules take their rise at more or less irregular distances apart, and run long distances crowded side by side; while in *Prodryas* the cell is open, and the subcostal nervules are much shorter and very uniform in their distribution; the inferior subcostal nervules also originate in *Prodryas* in a much simpler fashion, indicating that its ancestors never had the cell closed, although a foreshadowing of the closure may be seen in a row of special scales (or a line of color) at the supposititious termination of the cell. That this can hardly indicate a true vein appears from the fact that there is not the slightest tendency of the opposing veins to approach each other at its extremities—a tendency which it would seem should naturally precede the formation of a vein; the second inferior subcostal nervule takes its rise from the first in just about the same manner as the second superior nervule originates from the main stem, neither its basal portion nor that of the first inferior nervule showing any noticeable tendency to bend abruptly and to help form the termination of the cell, as now appears in all *Præfecti* to a greater or less extent, and which, in some open-celled genera, seems to indicate the loss of a transverse discoidal veinlet after a previous possession. The presence of a transversely disposed pair of spots in the costo-subcostal interspace also indicates the probability that this interspace had hitherto never been narrower nor bridged by a vein.

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* The remnant of this insect's front wing is certainly simpler in markings than the upper surface of allied living Eugonias, but it may represent an inferior surface, in which case there is no special difference.

In the hind wings, there are two features of importance, besides the unusual openness of the cell, which is scarcely narrowed apically. The first is the course of the first subcostal veinlet, which originates far toward the base of the wing, and terminates where the costal nervure is sure to end in nearly all *Præfecti*,* at the upper outer angle of the wing. This necessitates a shortening of the costal nervure. I do not know of a single instance of such a feature among the members of this group of *Nymphales*, but it is an almost persistent character in the Pierids, and very common in the Satyrids. The other point is the extreme narrowness of the upper as compared with the lower median interspace, the former being scarcely more than half as broad as the latter, owing to the slight divergence and continual proximity of the outer branches of the median vein. The only other feature in which it differs unusually from its allies is in the brevity of the antennæ.

Prodryas persephone.—A single specimen (No. 394) was found in the Tertiary strata of Florissant, Colo., by Mrs. Charlotte Hill. It is in a wonderful state of preservation, the wings expanded as if in readiness for the cabinet and absolutely perfect, with the exception of the tail of the right hind wing. The thorax and abdomen are perfectly preserved, but indications only of the legs are seen beneath the wings. The head is twisted so as to throw both antennæ upon one side, and to exhibit the palpi better than would otherwise be the case. The tongue is doubtless preserved, but the danger of injuring the palpi prevents me from chipping the stone to find it. The antennæ are nearly perfect, but the stalk is covered with a thin film of stone, which will not scale, and thus conceals the joints. The markings of the wings are perfectly preserved, but on the costal area of the hind wings are partially concealed by the overlapping of the front wings. In many parts of the wings, the form of the scales even can be determined under the microscope. This I was unable to do in any of the European fossil butterflies, although in some the points where they were inserted could be seen.

The wings are rather dark brown, deepening in tint on the front wings toward the extreme base and along the immediate costal edge, ornamented with pale markings, which were, perhaps, bright-colored in life. Front wings with a mesial, transverse, slightly arcuate band, extending across the wing at right angles to the costal border, just failing to reach either margin, divided by every nervule, its inner margin continuous and nearly straight, its outer strongly crenulate, being gently convex in the discoidal cell (more below than above), strongly convex in the lower median and submedio-internal interspaces, and strongly sinuous in the medio-submedian interspace; its upper extremity is before the middle of the wing, and incloses in its middle the base of the first superior subcostal nervule; its outer border is bent inward below the cell, exactly to the last divarication of the median nervure, and it reaches the anal area of the wing two-thirds the distance from the base. A row of five unequal pale spots crosses the wing in a straight line, extending from the lower outer angle to the costal margin at two-thirds the distance from the base; four of these are approximated in the subcostal interspaces; the fifth and largest is in the middle of the upper median interspace, but nearer the middle than the upper median nervule; it is broadly ovate and obliquely placed, subparallel to the mesial band, its broader extremity above; the lower of the subcostal spots, before the middle of the lowest subcostal interspace, is obovate, still more oblique, pointing toward the upper of the subcosto-median spots to be mentioned, and only a little smaller than the median spot. The three spots above this are equal, about half as large as the previous, twice as long as broad, rounded, subquadrate, each occupying nearly the entire breadth of the subcostal interspaces next succeeding; the upper two appear as a single spot, being scarcely divided by the intervening third superior subcostal nervule. Still nearer the outer margin of the wing, and parallel to the row of spots just mentioned, are two subequal, rounded, obovate spots, slightly broader than long, the upper a little the larger, together occupying the entire breadth of the subcosto-median interspace, removed by less than twice their width from the row of spots previously mentioned; the fringe of the wing appears to be slightly darker than the ground-color.

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* In *Polygonia* and some of its immediate allies, the upper outer angle of the hind wing is curiously excised, throwing the costal nervure back some distance.

Hind wings with a very large pale spot occupying the entire upper outer angle of the wing, reaching from the outer margin nearly halfway to the base, and from the costal margin to the upper median nervule; its basal margin is convex in the subcosto-median interspace, following what would perhaps naturally be the outer limits of the cell, while on either side of the lowest subcostal nervule the spot is separated from the outer margin of the wing by a narrow dark edging. On the irregular border which faces the median nervure, this pale spot emits three long, more or less sinuous tongues of pale color: one a very narrow, nearly straight, stripe or line along the margin itself, which only extends to the elongated upper median nervule, the breadth of the spot being less toward the margin than in the middle of the wing; a second, subparallel to the outer border, and therefore arcuate, as well as slightly sinuous, subequal, more or less broken into transverse spots, extending to the inner margin, and distant, beyond the middle median nervule, about half an interspace's width from the outer margin; beyond the submedian it is very faint, and above it the spot is broader; the third, slightly narrower, subparallel to the second, but running more nearly at right angles to the nervules, extends in a slightly sinuous course across the median interspaces only, tapering apically. In addition to these markings, there is a series of submarginal pale dots in the lower half of the wing, one in the narrow (upper median) and two in each of the broader interspaces, besides a larger roundish or subtransverse dark spot, deepening centrally in color, in the medio-submedian interspace, between the submarginal pale dots and the middle tongue of the large pale spot, which here tend to inclose the dark spot in an annular pale ring, and give it the appearance of a rather obscure ocellus. Above the tail, the fringe appears to be concolorous with the pale ground; below it, darker than the adjoining dark ground-color. The scales on the outer half of the front wing are two or three times as long as broad, with straight parallel sides, a well-rounded base, and a deeply combed apex, consisting of from three to five, usually four, entirely similar, equidistant, tapering, finely pointed teeth, of equal length, or the middle ones slightly larger, the outer ones at the edges of the scale, all nearly a third as long as the scale itself.

Length of body 22^{mm}, of palpi 2.4^{mm}, last joint of same 1.3^{mm}, of antennæ 10.5^{mm}, of club of same 2.5^{mm}; breadth of latter 0.85^{mm}, length of thorax 6.5^{mm}, its breadth 5.5^{mm}; expanse of wings 54^{mm}; length of front wing 24.5^{mm}, its outer margin 18^{mm}, its inner margin 15^{mm}; breadth of wing, 14.5^{mm}; length of hind wing, excluding tail, 18^{mm}; additional length of tail 3.25^{mm}; breadth of latter at base 1^{mm}, in the middle 0.55^{mm}; greatest breadth of hind wing 16.75^{mm}; length of abdomen 13^{mm}; breadth of same 5^{mm}.

DIPTERA: PALEMBOLUS (πάλαι, ἔμβολος).

The dipterous family *Hirmoneuridæ*, or *Nemestrinidæ*, is composed of somewhat anomalous forms, allied to the *Bombylidæ*, with which they were formerly classed, but showing in the neuration of their wings a decided affinity to the *Midasidæ*. The family is divided by Loew into two sections, in one of which the mouth-parts are inconspicuous, while in the other they project far beyond the head, and may even extend to a length exceeding several times that of the body. It is a tropical family, and only a single species (*Hirmoneura clausa* Sack. from Texas) has been described from the United States, and only one more is known from North America. The genus now brought to light from the Tertiary rocks of Colorado is not only distinct from any previously known, but belongs to the rhyncocephalous division of the family, now first recorded from North America.

The head is narrower than the thorax; the labium twice as long as the thorax; labrum and other aculiform parts of the proboscis a little shorter, reaching as far as the base of the terminal knob of the proboscis; clypeus exceedingly large, being longer than the head, nearly twice as long as broad, narrowing slightly, broadly rounded at the tip; antennæ apparently biarticulate, the basal joint being invisible, separated as widely as the eyes, the first (visible) joint cylindrical, scarcely longer than broad, the second semi-globular or bluntly conical, as broad at base as the first and of equal length and breadth; the style scarcely out of center, more than twice as large as the two joints combined, one-fourth their width at base, tapering on the apical half, composed of three joints, of which the terminal is as long as the other two combined, and the basal is a little longer than the middle joint; possibly the style has a minute basal joint, as in *Megistorhynchus*, but, if so, it must be so closely connected with the apex of the conical apical joint of the antennæ as to form a part of its curve. Eyes naked, separated in front by more than half their own width. As the palpi cannot be seen, it is probable that they are minute and wholly concealed beneath the head. Front equal, clothed rather abundantly with long bristles, more abundant away from the middle line. Thorax stout, of equal width with the abdomen; the latter is very much elongated in the female, tapers to a point, is more than twice as long as the thorax in the single specimen before me (where the joints are separated as widely as possible—probably half as long again as the thorax when in a natural position), and broadest on the second and third joints. Legs not preserved. Wings long and slender, tapering on the apical half, all the veins at the apex of the wing subparallel or equally converging toward the tip, having a general longitudinal direction; there are only two submarginal cells, and the peduncle of the third longitudinal vein is nearly one-third as long as the second submarginal cell; the base of the third longitudinal vein with a portion of the fourth and fifth and the middle bent portion of the anterior intercalary vein form together a continuous, nearly straight, scarcely arcuate, oblique, adventitious vein, extending from the second longitudinal vein near the middle of the wing to beyond the middle of the outer half of the posterior border; there are five posterior cells, of which the fourth is closed, and the third and fifth open upon the apical half of the posterior border; the third basal cell is barely open; there is no reticulation, and all the cells throughout the wing are of remarkably similar breadth.

This genus would undoubtedly fall into *Nemestrina* as originally founded; but several genera have been separated from it on good grounds, and the present form must stand in a similar relation to it Apparently it is more nearly related to the South African genus *Megistorhynchus* Macq. than to any other genus, but differs from it in the want of an additional closed submarginal cell and apical reticulation of the wings, in the remarkable straightness (as in *Trichophthalma* Westw.) of the accidental oblique vein beyond the middle of the wing, in the slenderness of the basal and discal cells, and in the simplicity and directness of the sixth longitudinal vein. It appears also to differ to a slight extent in the antennæ.

Palembolus florigerus.—A wonderfully preserved specimen (No. 465 in which everything but the legs and palpi are visible, the parts of the proboscis being separated, was found in the shales of Florissant by Mrs. Hill. The entire body is very dark-colored, with black hairs; a minute tuft of spreading hairs is found at the middle of the upper base of the proboscis. The posterior flanks of the thorax are fringed with hairs, and broad open tufts adorn the sides of the 2d–4th and the middle of the posterior border of the 6th–7th abdominal segments, while the entire posterior border of the 4th–8th and the whole dorsal surface of the 9th segment are similarly adorned. Wings hyaline, immaculate, the anterior border straight until near the extremity, where it is strongly and regularly curved; posterior border gently convex, and at the middle bent, the apex rounded, placed below the middle of the wing and somewhat pointed. The second longitudinal vein takes its rise from the first before the middle of the wing, runs nearly parallel to it throughout its course, most distant from it in the middle. The third longitudinal vein originates from the second close to its origin, and still before the middle of the wing, and runs toward the middle of the outer half of the posterior border, half-way to which it strikes the small transverse vein, there turns toward the apex and soon forks, both branches running longitudinally. The fourth longitudinal vein arises from the fifth before the middle of the basal half of the wing, is almost immediately united, by an oblique vein running upward and outward, with the first longitudinal vein, and then continues in an arcuate course, not far distant from the veins on the other side of the first basal cell, to the small transverse vein; here, by a slight angle, it assumes nearly the course of this and the base of the third longitudinal vein, until it runs into the anterior intercalary vein, when it suddenly turns outward, and extends to the tip of the wing, parallel to the posterior border, a slight bend upward at its apex preventing it from striking the very tip of the wing; both the small or middle and the posterior transverse veins are exceedingly brief. The fifth longitudinal vein has a nearly direct course from the base to the middle of the outer half of the posterior border, but is twice bent; once at its extreme tip, where its apex forms part of the oblique adventitious vein, and is connected by the posterior transverse with the anterior intercalary vein; and again doubly, some way beyond its middle, where just beyond the tip of the sixth longitudinal vein it is united to the posterior border by the posterior basal transverse vein; here it bends forward nearly at right angles to meet the anterior intercalary vein, and almost immediately bends as suddenly to resume, by a slight curve, its original direction. The anterior intercalary vein, which plays so extraordinary a part in this family, originates from the lower edge of the fourth longitudinal, half-way from its origin to the small transverse vein, and runs parallel to and just outside of the posterior basal transverse vein, until it strikes the upturned bend of the fifth longitudinal vein, curving at the same time downward toward the final angle of the fourth longitudinal vein; here it unites with that vein for a very brief distance, then contributes its part toward the adventitious oblique vein, until close to the posterior border; when, at its union with the fifth longitudinal by the posterior transverse vein, it suddenly bends outward, and running parallel to and midway between the extremity of the fourth longitudinal vein and the posterior border, terminates just below the tip of the wing. The third and fifth posterior cells are of nearly equal length.

Length of body (exclusive of proboscis, but with abdominal segments extended) 19^{mm}, of head 3^{mm}, breadth of same 3.75^{mm}; length of proboscis 12.5^{mm}, of labrum, etc., 11^{mm}, of clypeus 3.15^{mm}, breadth of same at base 1.9^{mm}; length of antennæ 1.5^{mm}, of style 1^{mm}; breadth of base of antennæ 0.2^{mm}, of basal joints of style 0.05^{mm}; length of thorax 5.5^{mm}, breadth of same 5.35^{mm}; length of wing 12^{mm}, breadth of same in middle 3.25^{mm}; length of first basal cell 4.75^{mm}, breadth of same in middle 0.4^{mm}; length of abdomen as preserved 10.5^{mm}, same with segments naturally withdrawn 7^{mm}, breadth of second and third joints 5.5^{mm}.

COLEOPTERA: PAROLAMIA (πάρος, *Lamia*—nom. gen.).

A genus of *Cerambycidæ*, closely allied to *Lamia*, but differing from it in the brevity of the head and the structure of the antennæ. Body heavy, moderately elongated. The head is less than half as long as the prothorax, with less prominent and more nearly approximate antennal tubercles, as compared with *Lamia*. Antennæ moderately slender, half as long again as the body, composed of eleven joints, each cylindrical, scarcely expanded at the distal extremity; the basal joint is short and stout, its length less than half the width of the head, less than twice as long as broad, tapering apically almost as much as at base; the second joint small, of equal diameter with the succeeding, and broader than long; the remaining joints subequal in length, each equal in width until close to its tip, when it expands slightly, the terminal a little shorter than the penultimate. Prothorax transverse, with a not very large spine on either side; scutellum larger than in *Lamia*. Tegmina not connate, together more than half as broad again as the base of the pronotum, but with rounded humeral angles, not in the least produced, and with no basal tubercles; they are nearly parallel in their basal half, but beyond taper regularly, though but slightly, the tip rounded, but not so declivant exteriorly as in *Lamia*. Last segment of the abdomen transverse, but longer than in *Lamia*, broadly and regularly rounded, with no excision of the apex.

This insect is interesting from its belonging to a group not now represented on this continent, the true *Lamioides*, which are found exclusively in Europe and Africa, and have their home in the Mediterranean region. Our nearest allies are the species of *Monohammus*. In its form, and the sculpturing of the surface, it most recalls the genus *Lamia* proper, but differs from it as well as from the neighboring genera in important particulars, which will, perhaps, be increased in number when other specimens permit us to know the peculiarities of the structure of the legs and sternal surface.

Parolamia rudis.—A single well-preserved specimen (No. 7807) was obtained in the Florissant beds. The elytra are parted and thrust forward upon the prothorax, concealing its outer posterior portions; but this permits the abdomen to be seen, and all other parts which could be seen on a dorsal view are present excepting the legs. The head is nearly smooth, or appears to be slightly scabrous; the antennæ are nearly smooth, the basal joint mesially carinate above, the last joint bluntly pointed. Prothorax subquadrate, a little transverse, the extent of the lateral spines concealed; surface rather coarsely and pretty uniformly scabrous. Elytra coarsely granulate at the base, the granulations becoming gradually fainter until they disappear, the apical quarter being free, although the surface is not uniform; outer and inner edge minutely marginate. A fragment of one of the wings remains, showing that the insect was not apterous.

Length of body 22.5^{mm}, of head 2.5^{mm}, of thorax 4^{mm}, of abdomen 16^{mm}, of antennæ 26.5^{mm}, first joint of same 2.5^{mm}, its width 1.25^{mm}, length of third joint 4.5^{mm}, its width at base 0.7^{mm}, at tip 0.9^{mm}, length of penultimate joint 4^{mm}, its width at base 0.5^{mm}, at tip 0.6^{mm}, length of last joint 3.25^{mm}; width of prothorax, exclusive of spine, 6^{mm}; width of elytron at base 4.5^{mm}, in middle 4.25^{mm}, at one millimeter from tip 2.5^{mm}; length of elytron 14^{mm}.

HEMIPTERA: PETROLYSTRA (πέτρος, *Lystra*—nom. gen.).

One of the most striking instances of tropical affinities in the Tertiary shales of Florissant is found in the presence of two species of a genus of huge Homoptera, rivaling the famous lantern-fly of South America in size, but differing in neuration and other features from any genus hitherto described. At first glance one would think it belonged to the *Fulgorida*, a subfamily which, with *Cicadina*, includes most of the larger forms of the suborder, and to be somewhat nearly allied to *Paralystra;* but it differs from this, and so far as I can determine from all *Fulgorina*, in the minuteness of the scutellum, and must be referred instead to the *Aphrophorina*, although very much larger than any species of that group which I find noticed, while in comparison with the temperate forms of that subfamily it is gigantic, our own largest species not exceeding one-fourth its length.

The body is robust, the head large, apparently flat above, about twice as broad as long, but considerably narrower than the thorax, the front regularly and very broadly convex; clypeus about half as broad as the head, somewhat convex, coarsely carinate down the middle with distinct lateral transverse rugæ; ocelli indeterminate; rostrum shorter than the breadth of the tegmina. Thorax broadening posteriorly, continuing the curve of the head; the front margin rather deeply and very broadly excised, so that its middle is straight and the lateral angles are rather sharply angulate; the hind margin with very oblique sides, so that if continued they would form less than a right angle with each other, but toward the middle line incurved, so that the thorax is rounded posteriorly and excised in the middle. Scutellum very small, scarcely more than half as long as the thorax and rather longer than broad, tapering more rapidly in the basal than in the apical half. The fore tibiæ apparently unarmed, and of the same length as the fore femora; the apical tarsal joint of same legs tumid, longer than the other joints combined, of which the second is less than half as long as the basal joint, the whole leg only a little longer than the breadth of the tegmina; fore coxæ apparently in close proximity. Tegmina large, nearly equal throughout, the inner base angularly excised next the posterior border of the thorax, the apex well rounded, a little produced anteriorly; it was apparently coriaceous, with little mark of any excepting some of the principal veins, which are elevated. The base of the costal part of the wing is so expanded, to give equality to the wing, that the radial vein at its base is very near the middle of the tegmina, and continues so until it forks in the middle of the basal half of the tegmina; its lower branch continues its course subparallel to the costal margin, while the upper branch curves upward, and follows close to the costal margin, until, like its fellow, it is lost in the membrane near the tip of the tegmina; the *sutura clavis* runs straight to the posterior border beyond the middle of its outer half, and midway between the two the radial originates, forking almost immediately, the forks dividing the inner area equally between them, and in the middle of the outer half of the tegmina united to each other by a cross-vein, to which they bend; they too are lost before the tip. The wings are not sufficiently preserved to characterize, beyond mentioning that the upper three nervules agree with Stål's figure of *Liorhina*, excepting that the third is not united apically with the fourth by an elbowed marginal vein, although it diverges apically from it. Abdomen more than twice as long as the rest of the body, tapering regularly to a pointed extremity.

Petrolystra gigantea.—Two nearly perfect specimens (Nos. 411, 412,) reverses of each other, were picked up by a child just as I reached the quarries at Florissant, and another, a fragment of a wing (No. 11,241), was afterward found in the same place. The head was apparently dark-colored, the thorax not so dark, delicately and softly shagreened with a slight median carina. The tegmina are almost similarly rugulose; the costa of the same is pretty strongly convex at base, very slightly convex beyond the middle of the basal half; the posterior border is slightly excised at the tip of the clavus, and the outer margin is oblique, being angularly excised at the posterior angle, although rounded throughout. It was dark, darkest at base and gradually growing lighter, more fuliginous toward the tip (although all the specimens do not show this), and traversed by four equidistant transverse pale bands, the basal one reduced to a spot in the middle of the extreme base, where it occupies about one-third the width of the wing; and the apical one rather cloudy, half as broad as the breadth of the tip and as far from the tip as from either border, equal, two or three times as broad as long, sinuous or lunate; the other two are more distinct, with sharply defined borders and irregularly sinuous; the outer of the two traverses the entire wing, touching the costal border, however, by only the tip of the rounded extremity, while it expands upon the posterior border; the inner of the two is rounded at either extremity, fails of reaching either border, and is constricted just beneath the radial vein; both of these bands average in width the breadth of the interspaces.

Length of body 23.5^{mm}, of head 3.75^{mm}, of thorax 4.5^{mm}, of abdomen 15.25^{mm}; width of head 7^{mm}, of clypeus 3.8^{mm}; length of rostrum 8.5^{mm}; width of thorax behind 8.5^{mm}; length of scutellum 3^{mm}, its breadth at base 2.5^{mm}; length of tegmina 29.5^{mm}, width next base 10.5^{mm}, near tip 8.5^{mm}.

Petrolystra heros.—A single specimen (No. 11,829) shows one of the tegmina in a good state of preservation, together with both fore legs. It was obtained at Florissant by Mrs. Hammon, and differs from *P. gigantea* in the broader bands of the tegmina and in the form of the latter, the posterior border being slightly fuller at the base, so as to make that part of the wing proportionally broader; while the posterior angle of the tip is not obliquely excised, making the extremity docked rather than pointed. The bands have expanded so as to occupy the larger part of the wing; the basal spot occupies the entire base from border to border, excepting the very root, as far as an oblique transverse line, subparallel to the inner basal edge of the wing, and distant from the root nearly half the width of the wing; it also infringes upon that bordering line by a large semicircular excision in the middle; the apical spot is very nearly as long as broad, and stops just short of the margin on all three sides of the apex, and in the middle of the wing breaks through the intervening dark stripe into the outer of the two middle bands; these two middle bands are also much broader than in the other species, but not to so great a degree as the extreme bands; they reach from border to border, and are united to each other and to the basal spot along the *sutura clavis;* the wing, therefore, has the appearance rather of being pale, with three transverse dark stripes, which are broad (and the outer two triangular) on the anterior half of the tegmina, narrow, sinuous, and broken on the posterior half.

Length of tegmina 28.25^{mm}, width at base 10.8^{mm}, at tip 7.2^{mm}, length of fore femora 4.5^{mm}, fore tibiæ 5^{mm}, fore tarsi 2.75^{mm}, first tarsal joint 0.8^{mm}, last tarsal joint 1.7^{mm}, claws 0.5^{mm}.

ORTHOPTERA: LITHYMNETES (λίθος, ὑμνητής).

A stout-bodied genus of *Phyllophoridæ*, probably belonging near *Steirodon*, but differing from the entire series into which *Steirodon* and its allies fall in the great length of its ovipositor, which is at least as long as the abdomen; while in *Steirodon* and its allies, so far as I know them, it is seldom more than two or three times as long as broad; it is also peculiar in the disposition of the principal radial branch of the tegmina. The head is large, full, well rounded; the eye small, almost circular, its longer diameter at right angles to the extremity of the vertex. The pronotum shows no sign of having its lateral borders cristate or even crenulate, but this may be due to imperfect preservation of the single specimen at hand, on which it is impossible to determine the form of the lateral lobes. Tegmina much longer than the body, densely reticulated, very ample, expanding at the very base, so as to be nearly equal before the extremity; this is destroyed, but is evidently formed somewhat, and perhaps exactly, as in the *Steirodon* series, since it tapers on either border, but more rapidly on the inner than on the costal margin, its curve indicating that the apex of the wing is above, and probably considerably above, the middle. The scapular vein, in the middle of the basal half of the wing, curves strongly toward the costal margin, nearly reaching it beyond the middle of the same, and thence following nearly parallel and in close proximity to it; in the broader part of the costal area, beyond the subcostal vein (which acts in a similar manner), it emits three or four branches, the larger ones of which fork and, with the branches of the subcostal vein, strike the costal border at equal distances apart; all these branches are straight, and are connected by irregular weaker cross-veins, while the interspaces are filled with a still weaker, dense mesh-work. The externo-median vein, parallel to and separated distinctly from the preceding, emits the principal branch where the scapular curves upward; this branch continues the basal course of the main vein, is straight, forks at about the middle of the wing, each fork again branching at a little distance beyond, the branches of the upper fork striking the border of the wing where it seems probable the apex falls; all the branches of this fork curve a little, but only a little, downward; the second branch of the externo-median vein is emitted shortly before the middle of the wing, and does not reach the margin, dying out shortly beyond the middle of the wing. The subexterno-median vein runs above the middle of the remaining portion of the discoidal area, and emits four inferior branches, at subequal distances, the first of which forks and the second originates opposite the principal branch of the externo-median vein. Apparently the anal area is pretty long. Wings apparently extending beyond the tegmina. The legs are short, slender, the fore tibiæ apparently furnished with a moderately broad obovate foramen, the hind tibiæ of equal size throughout, slightly longer than the hind femora, and the latter scarcely extending beyond the abdomen. Ovipositor long, broad, saber-shaped, a little upcurved.

This is one of the largest, if not the largest, Tertiary Locustarian known.

Lithymnetes guttatus.—This is the largest insect I have seen from the

Tertiary shales of Florissant, and is remarkable for the markings of the tegmina, which are covered throughout (with the possible exception of the anal area and the extreme base of the wing, which are obscure) with minute, circular, equidistant pale spots, situated between the nervules; they have a mean diameter of half a millimeter, and a mean distance apart of one and a half millimeters. The head is full and regularly rounded, on a side view, with no prominences. The antennæ appear to have the usual structure, but the second joint is small, and the thickness of the joints above the front of the prothorax is 0.45^{mm}, already diminishing to 0.3^{mm} at the posterior border of the same; they are broken shortly beyond this point, so that their length cannot be determined. The mean diameter of the eyes is scarcely more than one-third the shortest length of the genæ. The costal margin of the tegmina is gently convex, with a regular curve throughout, or until close to the tip; the inner margin has a similar though slighter convexity; the principal branch of the externo-median vein passes through the middle of the wing. The legs are all slender, the hind femora very slight, but little incrassated toward the base, the hind tibiæ slender, equal throughout, armed at tip with a pair of small, moderately stout, black-tipped spurs, the hind tarsi about two-fifths the length of the tibiæ, the claw very slight. Ovipositor broad, gently curved, at least as long as the hind tibiæ, of nearly equal size upon the part preserved.

Length of body (excluding ovipositor) 37^{mm}; depth of head 12.5^{mm}; larger diameter of eye 1.85^{mm}, shorter 1.35^{mm}; distance from lower edge of eye to upper edge of mandibles 4^{mm}; length of preserved part of tegmina 45.5^{mm}, probable length of same 55^{mm}; distance from base of tegmina to front of head 13^{mm}, from same to base of principal branch of externo-median vein 14.5^{mm}; breadth of tegmina in the middle 16^{mm}; length of femora[*] 9^{mm}; middle femora[*] 10^{mm}; hind femora 19^{mm}; fore tibiæ 9.5^{mm}; middle tibiæ 10.5^{mm}; hind tibiæ 21^{mm}; fore tarsi 7^{mm}; hind tarsi 8^{mm}; apical spurs of hind tibiæ 1.75^{mm}; claw of hind tarsi 0.9^{mm}; greatest breadth of hind femora 3^{mm}; length of ovipositor (broken) 18^{mm}, breadth at base 3^{mm}, at a distance of 14^{mm} from base 2.35^{mm}.

The specimen (No. 11,557) was found at Florissant by Mrs. Charlotte Hill, and is preserved on a side view, with the left (upper) tegmen and the ovipositor drooping, the other parts in a natural attitude, the legs drooping.

NEUROPTERA: DYSAGRION (δῦς, *Agrion*—nom. gen.).

This new type of *Agrionina* belongs to the legion *Podagrion* as defined by Selys-Longchamps, having a normal pterostigma, much longer than broad, the median sector arising from the principal vein near the nodus, the subnodal a little further out, the quadrilateral nearly regular and longer than broad, and many interposed supplementary sectors.

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[*] There is some doubt about these measurements, the basal portions being obscure.

It differs somewhat remarkably, however, from any of the genera given in that author's *Synopsis des Agrionines* (1862) in several points, as will be seen on reviewing the following characteristics.

The median sector arises from the principal vein more than one-third the distance from the nodus to the arculus; the subnodal arises from an extension of the nodus, which in passing below the principal is directed somewhat *inward* instead of outward, a somewhat extraordinary feature; the nodal arises from the principal only as far beyond the nodus as the median originates before it, or scarcely more than one-fifth way to the pterostigma, which is four times as long as broad, surmounts about four cellules, is a little dilated, oblique both within and without, but especially pointed above on the outer side, touching the costal margin throughout. The reticulation of the upper half of the wing is mostly tetragonal, and in the discoidal area very open, while in the lower half of the wing it is mostly pentagonal, and dense apically; this results in part from the *great number* of interposed supplementary sectors, of which there are several between the principal vein and the ultranodal sector, and several between each of the following sectors as far as the upper sector of the triangle; the upper of these curve somewhat downward as they approach the apical border. The postcostal area has at first two rows of cellules, but it expands rapidly below the nodus, and then has three and afterwards even four rows. The quadrilateral is only half as long again as broad, its upper somewhat shorter than its lower side. The nodus is situated at an unusual distance outward, indeed *not very far before the middle* of the wing (about two-fifths the distance from the base), and at a third of the distance from the arculus to the pterostigma. The petiole terminates at some distance *before* the arculus and is very slender. The wing is rather full in the middle, and the apical half of the posterior border is very full, the apex falling considerably above the middle of the wing.

These characters show the nearest alliance to *Philogenia*, but the genus differs strikingly from that in the position of the nodus, its retreat below the principal sector, the character of the postcostal area, and in the great number of the supplementary sectors, as well as in less important characters, such as the density of the reticulation and the form of the quadrilateral. It seems indeed to be a very aberrant member of the legion. As the members of this group are all tropical, and those to which this is most nearly allied (as indeed two-thirds of the species) are from the New World, this is an additional instance of neotropical alliances in the insect-fauna of our Tertiaries.

It is upon the wing that I would establish this genus. Yet fragments of other parts of the body occur with the wings, showing that the legs were probably long and slender, furnished with spine-like hairs as long as the breadth of the femora. The abdomen was moderately slender, rather longer than the wings; its ninth and tenth segments a little enlarged, the tenth half as long as the ninth, and the eighth half as long again as the ninth, and a little more than half as long as the seventh. The anal appendages were rounded triangular, as long as the tenth segment.

Dysagrion fredericii.—Several specimens of various parts of the body with wings were found by Mr. F. C. Bowditch (after whom the species is named) and myself in the Green River shales, in a railway cutting by the river bank beyond Green River Station. The most important are a nearly perfect wing and its reverse (Nos. 4167, 4168), which preserve all the important points of the neuration. A single antecubital appears to be present, nearer the nodus than the arculus; the principal sector, like the short sector (*sector brevis*), bends slightly upward just as it reaches the arculus; the cellules in the discoidal area are half as broad again as long, yet the breadth of the wing is such that the broadest part of the postcostal space, between the nodus and the middle of the wing, is more than half as broad as the rest of the wing at that point. The wing is wholly hyaline, excepting the infumated pterostigma, which is bordered by thickened black veins, and surmounts four cellules at its lower margin; the veins of the wing generally are testaceous; there are 20 postcubitals.

Probable length of the wing 38–39^{mm}; length of part beyond peduncle 34^{mm}, breadth 9^{mm}; distance from nodus to tip of wing 23^{mm}; length of pterostigma 3.5^{mm}.

Another wing from the same beds with its reverse (Nos. 4165, 4166) is very fragmentary, showing little besides the border of the apical half of the wing with the pterostigma, and most of the postcubital nervules. I have here considered it the hind wing of the same species, from its similar size, the exact resemblance of the pterostigma, which also surmounts four cellules, and the indication of a similar profusion of intercalated supplementary nervules. It seems, however, not improbable that it may prove to be a second species of the same genus, from the great difference in form. The two borders of the outer half of the wing are nearly parallel, and the apex falls a little below the middle. This difference, however, really concerns only the posterior curve of the wing below the apex. The nodus is not preserved. Greatest breadth 7.5^{mm}.

Considering the fragments of heads, etc., referred to under the genus as belonging to this species, we have to add Nos. 4179, 4180, and 4182 (besides No. 62 of Mr. Richardson's collection) as representing heads; Nos. 4183, 4184, the united head, thorax, and base of wings; and Nos. 4170, 4173, 4174, 4177, 4178, as parts of the abdomen. The abdomen shows a slender, dorsal, pale stripe, distinct and moderately broad on the sixth to the eighth segments, scarcely reaching either border, and posteriorly expanding into a small, round spot; and a faint dorsal line on the fourth and fifth segments, interrupted just before the tip. The appendages are simple.

Length of head (according to the mode of preservation) 4.0–4.5^{mm};

breadth of same 5.5^{mm}; length of thorax 5^{mm}, of pedicel of wing 5^{mm}, of abdomen (probably 1^{mm} should be added for a break at the base) 39^{mm}; length of segments 8–10, 6^{mm}; breadth of ninth segment 2.75^{mm}, of fifth segment 2.1^{mm}; estimated length of whole body 55^{mm}.

Corydalites fecundum.—Under this name I propose to class an insect which laid some remarkable egg-masses, obtained in numbers by Dr. C. A. White, at Crow Creek, fifteen miles northeast of Greeley, Colo., in lignitic beds of the Laramie Group. These egg-masses are five centimeters in length by nearly two in breadth and one in height, nearly equal throughout, rounded and slightly pointed at the tip, and of a dirty yellowish-brown. They contain each about two thousand eggs, definitely arranged, and coated with a covering of what was presumably albuminous matter, which also surrounds each egg. The close general resemblance of these eggs and of their clustering to that of the eggs recently referred by Mr. C. V. Riley to the neuropterous genus *Corydalus*[*] leave little doubt concerning their probable affinities. Mr. Riley's description is as follows :—

"The egg-mass of *Corydalus cornutus* is either broadly oval, circular, or (more exceptionally) even pyriform in circumference, flat on the attached side, and plano-convex [broadly convex is doubtless meant] on the exposed side. It averages 21^{mm} in length, and is covered with a white or cream colored albuminous secretion, which is generally splashed around the mass on the leaf or other object of attachment. It contains from two to three thousand eggs, each of which is 1.3^{mm} long and about one-third as wide [he figures them of a slenderer form], ellipsoidal, translucent, sordid white, with a delicate shell, and surrounded and separated from the adjoining eggs by a thin layer of the same white albuminous material which covers the whole. The outer layer forms a compact arch, with the anterior ends pointing inwards, and the posterior ends showing like faint dots through the white covering. Those of the marginal row lie flat on the attached surface; the others gradually diverge outwardly, so that the central ones are at right angles with said object. Beneath this vaulted layer the rest lie on a plane with the leaf, those touching it in concentric rows, the rest packed in irregularly."[†]

In the fossil ootheca the mass is much larger and more elongated, and possesses besides one characteristic in which it differs strikingly from that of *Corydalus* (and on which account, particularly, I have used a new generic appellation), viz: the division of its mass into two longitudinal and equal halves by an albuminous wall, or rather by double albuminous walls, which may be parted above, leaving as the only connection between the two halves their common albuminous floor. There are indeed a few specimens which show no sign of this division, but a median furrow, or a deeper and more complete separation of the two halves is so prevalent that this seems to be the only explanation to be offered for its appearance. Their absence in the few specimens is probably due to defect of preservation. The common albuminous floor and the upper and outer albuminous coating are of remarkable thickness, varying from one to three millimeters; but the coating attenuates to a mere lamella as it passes down the median furrow, so that when the mass remained quiet in the position in which it was laid, the lateral halves pressing closely against each other, the combined thickness of the two albuminous walls would together no more than equal the ordinary thickness of the albuminous partition between any two contiguous eggs. That such a partition existed even in those which do not show it now, seems probable from the regularity of the furrow in every instance of its occurrence and by its prevalence; some specimens merely show a sharp groove along the middle, the halves remaining in complete juxtaposition;* others again are so completely separated as to be curled over and meet beneath.

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[*] It has been suggested that these may belong rather to *Chauliodes*, a closely allied genus of *Neuroptera;* but Mr. Riley declares that they are identical with those found in the body of *Corydalus.*

[†] Proc. Amer. Assoc. Ad. Sc. xxv, 277-278.

This, together with the fact that the egg-mass is otherwise extremely regular (showing only so little plasticity as to allow one broad side to be straight, while the opposite is a little convex), and never exhibits the slightest tendency to coil longitudinally, leads me to believe that the egg-masses were laid in the water of shallow basins, upon the muddy floors, which could be reached by the abdomen of the insect while resting upon a stone or overhanging twig. In this medium, the albuminous secretion would expand to the utmost; if the bunch of eggs remained undisturbed, it would present us with the more regular hirudiform masses that have been found; if rolled about by the disturbance of the waters, the two halves would curl toward each other more or less closely, forming a subcylindrical mass, and inclose between their approaching walls more or less of the mud in which they are rolled. This is exactly the appearance of most of them now, inclosing the same substances as that within which they and the accompanying *Bulimi* and other fresh-water mollusks lie imbedded.†

These masses differ further from those of *Corydalus* in the extraordinary amount of albuminous matter by which both the entire mass and each individual egg was surrounded. This is perhaps to be explained by the medium in which they appear to have been laid, and will in part account for the vast size of the ootheca, which are much larger than any mass of insect-eggs which I can find noticed. The size of the mass, however, is also due to the greater magnitude of the eggs themselves, which are twice as long and proportionally larger than those of *Corydalus*, and lead to the conviction that we are to look in the rocks of the earliest Tertiaries for an insect of great magnitude, closely allied to our

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* These specimens are some from which weathering has removed their outer albuminous coating; perhaps, if this had remained, the furrow would have been concealed by the complete union of the attingent albuminous walls.

† The deposit in which they occur is a fresh-water one, but Mr. Lesquereux informs me that brackish-water forms are found both above and below them.

Corydalus, itself the largest of all known *Sialina*. It can hardly be doubted that it must have been at least double the size of the living type. The number of eggs laid is about or nearly the same as in *Corydalus*, presuming, in either case, all to be laid at once.

Compared with the eggs, the albuminous substance surrounding them is much softer, more or less friable, and rather easily removed, being everywhere composed of fibers running in the same direction as the longitudinal axis of the egg. The weathering of the specimens has been such that in several instances the whole albuminous cap has been removed, and in others a large part also of the interovular partitions, leaving the eggs standing erect, separated, each from its neighbors, by from one-third to one-half its own thickness. In many cases, the eggs can be pulled from their cells; and, although frequently flattened, they may be studied almost as well as if living. The eggs have an average length of 2.6^{mm} and a central width of 0.6^{mm}; they are nearly cylindrical, but faintly arcuate, slightly attenuated at the anterior extremity, and slightly tumid on the posterior half, at the tip of which they taper rapidly, rounding off to a rather broadly convex extremity, which is flattened or often sunken in a circular central space 0.1^{mm} in diameter, outside of which the surface is rather profusely filled with very shallow, obscure, circular pits, averaging 0.01^{mm} in diameter. The anterior extremity terminates in a slightly elevated, thin, subtuberculate rim, inclosing a terminal portion, whose surface gradually rises centrally to form a truncated cone, and is pitted with saucer-like depressions, gradually diminishing in size up the sides of the central extension; the latter is about as long as the breadth of its tip; its extremity, 0.04–0.055^{mm} in diameter, is more or less sunken, with a central circular pit (the micropyle) 0.01^{mm} in diameter; while the rounded margin of the extension is made more or less irregular by the saucer-like depressions which surmount it, but have now become of extreme minuteness. This structure of the anterior extremity of the egg agrees with what was previously known of the egg of *Sialis*, but no mention of the elevated point was made in Mr. Riley's description of the egg of *Corydalus*. It occurs there, however, as I find by examination of eggs he has kindly sent me. These eggs of *Corydalus* also show the sunken space at the posterior end, and the sides of the egg are marked nearly as in the fossil; the surface of the latter being broken up by scarcely elevated slight ridges into obscure transverse hexagonal cells, one-tenth of a millimeter long (across the egg) and one-fifth as broad, those of adjoining rows interdigitating.

In the disposition of the eggs, also, these masses differ from those of *Corydalus*, for they are arranged in a radiating manner around the longitudinal axis of the ootheca. All of them partake of this arrangement, even when, as rarely happens, there are two layers in place of one over parts of the mass; in no case are any of the eggs packed in irregularly, as is the case with a portion of those of *Corydalus*, according to Riley. As in *Corydalus*, however, the posterior ends are those which are directed toward the upper albuminous coating, which in many cases shows very slight subhexagonal or circular depressions or elevations corresponding to the position of the extremity of the egg beneath, just as in *Corydalus* the posterior ends of the eggs show "like faint dots through the white covering". The outer albuminous coating appears in the fossil to be made up of as many parts as there are eggs, the inter-ovular fibrous material extending to the surface of the ootheca, forming walls to deep cells which contain eggs, and which are corked up, as it were, by plugs of albuminous material. These plugs seem to be very similar to the cell-walls, having been composed apparently of viscous threads, also running in the same direction as the longitudinal axis of the egg; but in some cases the cell-walls beyond the eggs have become blackened, while the plugs retain their normal color, and separate readily from them.

When the egg-mass was undisturbed, the outermost eggs lay horizontally, and those next the median furrow vertically; the division walls of the cells were therefore thinnest below, and it appears probable that the young made their escape at the bottom of the median furrow, where the outer coating is also thinnest. Where double layers occur, the eggs of the upper seem to be in a direct line with those of the lower layer, egg for egg, as if a cell of double length were stocked with two eggs, separated by an albuminous partition; and in this case the albuminous floor and covering are thinner than usual, so that the egg-mass is not greatly enlarged nor distorted. When two layers were thus formed, the young larvæ of the upper layer must have escaped through the emptied cells of the lower.

It only remains to add that with a single exception these masses differ comparatively little in size, most of them being nearly or quite five centimeters long, although some scarcely exceed four centimeters. The single exception is of a mass only a little more than fifteen millimeters long, six millimeters broad, and three millimeters high. It shows no furrow, but may represent only one lateral half of an egg-mass, as the walls of one side are steeper than those of the other, and look like the sides of a median furrow. This mass is so small that only by presuming one-half to be gone, and the albuminous covering to be thinner than usual, can it be regarded as belonging to the same species with the others, although evidently of a similar nature. In case it belongs to the same species, it may be looked upon as probable that a female usually deposited all her eggs in a single bunch, but that some accident preventing it, the remnant were in this case subsequently laid in a mass of much smaller dimensions, one-half of which is preserved. This is the view I am disposed to adopt.

HOLCORPA (*ὁλκαίη, ὁρπή*).

This name is proposed for a genus of *Panorpidæ*, unquestionably allied to *Panorpa*, but differing remarkably from it in the total absence of cross-nervules in the wings, excepting, perhaps, at the base. The antennæ are probably not very long (they are not completely preserved in the specimen), taper very gradually in size, are composed of joints only a little longer than broad, not in the least degree moniliform, and furnished with recumbent hairs. The wings are not so elongate nor so slender as in *Panorpa*, very regularly rounded, both pairs similarly formed, the hinder pair slightly shorter than the front pair, as in *Panorpa.*' The costa is thickened, the subcosta extends beyond the middle of the wing, but does not reach the pterostigma; the radius emits a superior fork near the base of the wing, which strikes the pterostigma; or rather, which, by bending downward and then upward, forms the pterostigma in the middle of the apical third of the wing; the radius again forks in a similar manner still far before the middle of the wing, the upper branch emitting three parallel, equidistant, inferior branchlets, the uppermost close to the margin next the pterostigma, the lowest striking the apex of the wing; the lower radial branch forks below the middle branchlet of the upper radial branch. All these veins, excepting the pterostigmatic termination of the uppermost branch of the radial, are straight. The cubitus is also straight, until it forks a little before the middle of the wing; its upper branch is a little curved, and divides just below the forking of the lowest radial branch; its lower branch forks almost immediately, emitting at once three veinlets, the middle one of which is nearly continuous with the main stem, the others curving in opposite senses on either side of it. Below this the veins are not so readily determinable, and their description is omitted for the present; the only variation in the neuration of the two wings consists in the middle fork of the lower branch of the cubitus, which, in the hind wing, is not continuous with the main stem, but originates a very little beyond the others from the lower fork. The legs are spinous throughout; the tibiæ are also armed at tip with very long, straight, parallel spurs, and the tarsal joints with short spurs. The abdomen is greatly elongated, the first four joints subequal and nearly as broad as the slender thorax, but as a whole tapering slightly, and not greatly surpassed by the wings; the following joints greatly attenuated, the ninth, or terminal joint, composing the forceps, unfortunately lost.

Several fossil species have been referred to *Panorpa*, but with one exception they agree very closely with living types. The exception is the' insect figured by Brodie* from the Purbeck beds of England (*Panorpa gracilis* Gieb.), which is very small, and possibly may be more nearly related to *Holcorpa;* for while the general arrangement of the veins, with the notable exception of the cubital, is similar to what is found in *Holcorpa*, and very different from their disposition in *Panorpa*, no cross-veins whatever can be traced. The figure, however, is too small, coarsely executed, and is described by Giebel† as supplied abundantly with cross-veins! It certainly is not in my copy.

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*Foss. Ins. Sec. Rocks Engl., pl. 5, fig. 18.

† Ins. der Vorw. 258.

The name I have given should perhaps be written *Holchorpa;* but I have disregarded the aspirate, as Linné did in constructing *Panorpa.*

Holcorpa maculosa.—A single insect (No. 63), obtained by Mrs. Fisher from the Florissant shales of Colorado, has beautifully preserved wings and fragments of the rest of the body. The antennæ (which are not fully preserved) appear to have been more than half as long as the wings, the middle joints 0.17^{mm} long and 0.14^{mm} broad. The wings are less than three times as long as broad, and very regularly rounded; the costal vein (especially on the front wing) is thickened and covered with closely clustered, minute, spinous hairs; and similar black hairs follow in a single row the base of the radial and cubital veins. The wings are very dark, with large white or pale spots, of which three are most conspicuous, occurring similarly on all the wings: one, of a subquadrate or subovate form, broader than long, lies scarcely beyond the middle of the wing, extending from the costa to the upper branch of the cubital vein; another, nearly as large and similar in form, is subapical, extending from just beyond the last fork of the upper branch of the radial vein to or just beyond the upper fork of the lowest branch of the same; a third, smaller, transversely oval spot, lies next the inner border, below and a little outside the first mentioned, being situated just beneath the forking of the upper branch of the cubital vein; there is also more or less pale cloudiness about the basal half of the wing, and white flecks may be seen at various points near the tip, especially below the subapical spot. The abdomen resembles somewhat that of the remarkable *Panorpa nematogaster* M'Lachl. from Java, where it is greatly elongated, and possesses a curious appendage to the third joint. In the fossil species, the first three joints, taken together, taper gradually and slightly, and the third may have had a peculiar appendage at its tip, as the edge is not entire, but appears deeply excavated in the middle, possibly due, however, to its imperfect preservation; the basal half of the fourth joint partakes of the tapering of the abdomen, but its apical half is swollen and its hind margin broadly rounded; the fifth and sixth joints are a little longer and much slenderer than the preceding, subequal and cylindrical; the fifth depressed on either side at the base by a pair of foveæ; the seventh again much smaller, linear or not half the width of the sixth, increasing slightly in size apically; the eighth as large at base as the seventh at tip, enlarging slightly apically, and all the joints together half as long again as the wings. Most unfortunately, the apical joint is lost. The specimen is evidently a male.

Length of insect (excluding claw of abdomen) 30^{mm}, of abdomen (excluding claw) 23^{mm}, of front wing 18^{mm}, breadth of same 5.5^{mm}; length of hind wing 16.5^{mm}, breadth of same 5^{mm}; length of (fore or middle) tibial spurs 1^{mm}, of one of the (hind?) tarsal joints 1.2^{mm}.

Indusia calculosa.—In certain parts of Auvergne, France, rocks are found, which, for a thickness of sometimes two meters, are wholly made up of the remains of the cases of caddis-flies. These have been frequently mentioned by writers, and Sir Charles Lyell figures them in his Manual. Oustalet, in his recent treatise on the fossil insects of Auvergne, describes two forms,* one from Clermond, and the other from St. Gérand, which he distinguishes under the names *Phryganea corentina* and *P. gerandina*, principally from their difference in size and strength, and a distinction in the minute shells—species of *Paludina*—of which the cases are composed. One of them, however, probably the former, was previously named by Giebel† *Indusia tabulata*, a generic name which it would perhaps be well to employ for the cases of extinct *Phryganidæ*, until they can reasonably be referred to particular genera.

During the past season, Dr. A. C. Peale, in his explorations under the Survey, discovered on the west side of Green River, Wyoming Territory, at the mouth of Lead Creek, in deposits which he considers as probably belonging to the Upper Green River Group, or possibly to the lower part of the Bridger Group beds of limestone, the upper floor of which is completely covered with petrified cases of caddis-flies, all belonging to a single species, which may bear the name we have applied to it above. They vary from 14 to 19^{mm} in length, from 4 to 5^{mm} in diameter at their open anterior extremity, and from 3 to 3.2^{mm} at their posterior end, the thickness of the walls being about 0.75^{mm}. As will be seen by these measurements, the cases are a little larger at their mouth, but otherwise they are cylindrical, taper with perfect regularity, and are straight, not slightly curved, as in many Phryganid cases. They are completely covered with minute, rounded, water-worn pebbles, apparently of quartz, generally subspherical or ovate, and varying from one-third to two-thirds of a millimeter in mean diameter; they thus give the cases a granulated appearance. Nearly all the cases are filled with calcareous material, but some are empty for a short distance from their mouth, and in one case the inner linings of this part of the case has a coating of minuter calcareous particles, evidently deposited therein after the case was vacated. As the present thickness of the walls indicates (as also the size of the attached pebbles), the silken interior lining of the case must have been very stout. This follows also from the appearance of one or two which have been crushed; for they have yielded along longitudinal lines, indicating a parchment-like rigidity in the entire shell. In one of the specimens, the outer coating of heavier pebbles has in some way been removed by weathering, and has left a scabrous surface, apparently produced by minute, hard grains entangled in the fibrous meshes of the web; it still, however, retains its cylindrical form.

The size of the case, its form, and the material from which it is constructed seem to indicate that it belonged to some genus of *Limnophilidæ* near ***Anabolia***.

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* Bibl. École Haut. Études; Sc. Nat. iv, art. 7, pp. 101–102.

† Ins. der Vorw. 269.

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ART. XXV.—FIELD-NOTES ON BIRDS OBSERVED IN DAKOTA AND MONTANA ALONG THE FORTY-NINTH PARALLEL DURING THE SEASONS OF 1873 AND 1874.*

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BY DR. ELLIOTT COUES, U. S. A.,
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The following notes result from observations made in the field during my connection with the United States Northern Boundary Commission—Archibald Campbell, Esq., Commissioner, Major W. J. Twining, Corps of Engineers, U. S. A., Chief Astronomer. The line surveyed by the Commission in 1873 and 1874 extended from the Red River of the North to the Rocky Mountains, a distance of 850 miles, along the northern border of the Territories of Dakota and Montana, in latitude 49° north. During the season of 1873, I took the field at Pembina, on the Red River, early in June, and in the course of the summer passed along the Line nearly to the Coteau de Missouri, returning from the Souris or Mouse River via Fort Stevenson and the Missouri to Bismarck. This season's operations were entirely on the parallel of 49°, and in the watershed of the Mouse and Red Rivers, my principal collecting-grounds being Pembina, Turtle Mountain, and the Mouse River. This region of the northerly waters is sharply distinguished geographically and topographically, as well as zoologically, from the Missouri and Milk River Basin, which I entered the following year. In 1874, I began at Fort Buford, at the mouth of the Yellowstone, travelled northwesterly to 49°, which was reached at Frenchman's River, one of the numerous tributaries of Milk River, and thence along the parallel to the Rocky Mountains at Waterton or Chief Mountain Lake and other headwaters of the Saskatchewan; returning back on the Line to Three Buttes or Sweetgrass Hills, thence direct to Fort Benton, Montana, and thence by a boat voyage down the Missouri to Bismarck. In neither season was much collecting done except along the parallel itself; and the operations of each season were in a region sharply distinguished, as I have said, by its faunal peculiarities. From these two broad belts of country, corresponding at 49° nearly to the Territories of Dakota and Montana respectively, is to be set apart a third, that of the Rocky Mountains alone.

I made an elaborate comparison of the faunal characters of these three

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[* For articles on other portions of the same writer's collection, see this Bulletin, this Vol., No. 1, pp. 259–292, and No. 2, pp. 481–518.—ED.]

regions with reference to anticipated publication in connection with the official report of the United States Boundary Commission; but the present is hardly the place to present these considerations in detail. I may, however, state that my results agree closely with those derived from the geological investigations made by Mr. George M. Dawson, my colleague of the British contingent of the Survey, whose valuable Report should be consulted in this connection, and that they are in striking accord with what would be the geographer's or the topographer's consideration.

1. *Red River region*, or watershed of the Red and Mouse Rivers. At 49° this extends westward along the northern border of Dakota, nearly to Montana,—to the point where the Coteau crosses the Line. The bird-fauna of this region is decidedly Eastern in character,—much more so than that of the portion of the Missouri Basin which lies south of it and no further west. It is well distinguished, both by this Eastern *facies* and by the absence of the species which mark the Missouri region. The region consists of more or less (nearly in direct ratio as we pass westward) fertile prairie, treeless except along the streams, cut by the two principal river-valleys, the Red and the Mouse, crossed by the low range of the Pembina Mountains, and marked by the isolated butte known as Turtle Mountain. It is bounded to the west and south by the Coteau,—a comparatively very slight ridge, which nevertheless absolutely separates the two great watersheds. The Red River flows nearly due north; the Mouse River makes a great horseshoe bend, at first directed toward the Missouri, which it almost reaches before it is "bluffed off", literally, and sent northward.* The bird-fauna of Pembina and the whole immediate Red River Valley is thoroughly Eastern. The only Western trace I observed was *Spizella pallida* and some *Icteridæ*, especially *Scolecophagus cyanocephalus;* though *Sturnella neglecta* and *Xanthocephalus icterocephalus* are both common prairie birds much further east, as *Pediœcetes columbianus* also is. Characteristic mammals are *Spermophilus* 13-*lineatus*, *S. franklini*, *Tamias quadrivittatus*, *Thomomys talpoides*, and the rare *Onychomys leucogaster*. Out on the prairie, beyond the Pembina Mountains, this region is distinguished by the profusion of several very notable birds,—*Anthus spraguii*, *Plectrophanes ornatus*, *Passerculus bairdi*, and *Eremophila leucolæma*, all breeding, none of them observed at Pembina. Here also was found *Coturniculus lecontii*. This treeless area is further marked by the absence of sundry birds common enough in the heavily-timbered Red River Valley, as *Empidonaces*, *Vireones*, *Antrosto-*

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* Fort Pembina is situated on the Red River, latitude 49° nearly; longitude 97° 13, 42" west; altitude 790 feet above sea-level. The Pembina Mountains, well wooded, with a maximum elevation of about 1,700 feet, lie 35 miles west of the Red River, forming an escarpment which separates the low immediate valley of the Red River from the next higher prairie steppe, which reaches to the Coteau. Turtle Mountain is an isolated, heavily-wooded butte, 125 miles west of Pembina, with an elevation of about 2,000 feet above sea-level, lying directly on the parallel of 49°. Our camp, at its west base, was in longitude 100° 30′ 41.1", distant 149.25 miles from Pembina along the parallel.

mus vociferus, *Turdus pallasi*, *Geothlypis philadelphia*, *Goniaphea ludoviciana*, *Setophaga ruticilla*, and many others. *Spermophilus richardsoni* begins in this region, and *S. franklini* and doubtless *Onychomys* end here. There are Badgers in plenty and a few Antelopes; there were no Buffalo in 1873, though the country was still scored with their trails, and skeletons were plenty from the Mouse River westward. This region is still more strongly marked by the *absence* of the Missouri specialties.

2. *The Missouri region*, or the great watershed of the Missouri and Milk Rivers. As soon as we cross the Coteau, the whole aspect of the country changes, and there is a marked difference in the fauna. We enter a much more sterile and broken region, absolutely treeless excepting along the larger water-courses, full of "bad lands", with much sage-brush,—such country stretching, with scarcely any modification, to the base of the Rockies. In this latitude, the Milk River is the main artery, with many north-south affluents crossing 49°. The characteristic mammals are the Buffalo (first seen in 1874 in the vicinity of Frenchman's River), Antelope, Prairie and Sage Hares (*LL. campestris* and *sylvaticus* var. *nuttalli*), the Prairie "Gophers" (*Spermophilus richardsoni*, in extraordinary abundance), and Prairie "Dogs" (*Cynomys ludovicianus*), some of these being perfectly distinctive of the Missouri as compared with the Red River region. *Putorius longicauda* is the Ermine of this region. Kit Foxes (*Vulpes velox*) are common, but so they are along the Mouse River. The characteristic birds are *Calamospiza bicolor*, *Tyrannus verticalis*, *Plectrophanes maccowni*, *Pica hudsonica*, *Speotyto hypogæa*, *Centrocercus urophasianus* (diagnostic of the region, like the mammal *Cynomys ludovicianus*, or the reptiles *Phrynosoma douglassi* and *Crotalus confluentus*), and *Eudromias montanus*. Few, if any, distinctively Eastern birds extend across or even into this region. *Plectrophanes ornatus* goes to the mountains, but in diminished numbers; one specimen of *Neocorys* was taken near the mountains, but neither *Passerculus bairdi* nor *Coturniculus lecontii* was observed; *Eremophila* continues in full force.

The Sweetgrass Hills, or Three Buttes, are the most considerable outliers of the Rocky Mountains, along the parallel of 49°, quite isolated on the prairie. I noticed no avian specialties here, but Mountain Sheep were comparatively abundant (as they were also along the bluffs of the Missouri River, above the mouth of the Yellowstone), and the Yellow-haired Porcupine, *Erethizon epixanthus*, was numerous.

3. *Rocky Mountain region.*—Rising gradually and, of course, imperceptibly, the Missouri region maintains its features to the very foot of the mountains, the headwaters of the Milk River being prairie streams, sluggish, warm, and muddy, with much alkaline detritus. The divide between this watershed and that of the Saskatchewan is too slight to be recognized as such by an inexperienced eye; on passing it, we strike the clear, cold, turbulent streams from the mountains, abounding in *Salmonidæ*, and soon enter the woods. This region is strongly marked, not only by "Western" species, in the geographer's sense, but

by Alpine forms, strangers to lower altitudes at the same latitude, by exclusively arboreal forms, and by abrupt disappearance of the prairie types mentioned in the preceding paragraph. The marks of the region, as compared with the prairie, are unmistakable. We here find *Lagomys princeps* (down to 4,500 feet), *Tamias lateralis*, *Sciurus hudsonius* var., *Neotoma cinerea*, *Arctomys flaviventris*, among mammals; large game was scarce,—a few deer (*C. virginianus*), a bear or two, and an alleged *Aploceros montanus*. There were no live Buffalo, but plenty of skulls and skeletons far into the mountains. Among notable birds may be mentioned *Cinclus mexicanus*, *Dendrœca auduboni*, *Geothlypis macgillivrayi*, *Ampelis garrulus*, doubtless breeding !, *Perisoreus canadensis*, *Empidonax hammondi*, *E. obscurus*, *Selasphorus rufus*, *Picus harrisi*, *Asyndesmus torquatus*, the two Alpine Grouse, *Tetrao franklini* and *T. richardsoni* (together with *Pediœcetes*, which pervades all three regions), *Bucephala islandica* (breeding), and *Histrionicus torquatus* (breeding).

Some of the more conspicuous birds of the three regions, or of any one of them, may be tabulated in the following form. The implication in each case is simply my own observations, not the known general range of the species. All the species in this table, doubtless even *Ampelis garrulus*, were on their breeding-grounds, excepting a very few migrants seen early in June at Pembina.

	Red River region.	Missouri region.	Rocky Mountain region.		Red River region.	Missouri region.	Rocky Mountain region.
Turdus migratorius	×	×	×	Cyanurus cristatus	×	......	......
Turdus fuscescens	×	......	......	Perisoreus canadensis	......	......	×
Cinclus mexicanus	......	......	×	Tyrannus carolinensis	×	×	×
Sialia arctica	......	......	×	Tyrannus verticalis	......	×	×
Eremophila leucolæma	×	×	......	Sayornis sayus	......	×	×
Neocorys spragueii	×	×	......	Contopus virens	×	......	......
Mniotilta varia	×	......	......	Empidonax trailli	×	......	......
Helminthophaga celata	×	×	×	Empidonax minimus	×	......	......
Dendrœca auduboni	......	......	×	Empidonax hammondi	......	......	×
Dendrœca pennsylvanica	×	......	......	Empidonax obscurus	......	......	×
Dendrœca striata	×	......	......	Antrostomus vociferus	×	......	......
Dendrœca maculosa	×	......	......	Trochilus colubris	×	......	......
Geothlypis philadelphia	×	......	......	Selasphorus rufus	......	......	×
Geothlypis macgillivrayi	......	......	×	Cocygus erythrophthalmus	×	......	......
Setophaga ruticilla	×	......	......	Picus villosus	×	......	......
Ampelis garrulus	......	......	×	Picus harrisi	......	......	×
Vireo philadelphicus	×	......	......	Melanerpes erythrocephalus	×	×	......
Plectrophanes ornatus	×	×	......	Asyndesmus torquatus	......	......	×
Plectrophanes maccowni	......	×	......	Colaptes auratus	×	......	......
Centronyx bairdi	×	?	......	Colaptes "hybridus"	......	×	×
Coturniculus lecontii	×	......	......	Speotyto hypogæa	......	×	......
Junco hyemalis	×	......	......	Falco polyagrus	......	×	?
Zonotrichia querula	×	......	......	Buteo swainsoni	×	×	×
Melospiza melodia	×	......	......	Tetrao franklini	......	......	×
Calamospiza bicolor	......	×	......	Tetrao richardsoni	......	......	×
Pipilo erythrophthalmus	×	......	......	Centrocercus urophasianus	......	×	......
Pipilo arcticus	......	×	×	Pediœcetes columbianus	×	×	×
Icterus spurius	×	......	......	Endromias montanus	......	×	?
Icterus baltimorii	×	......	......	Recurvirostra americana	......	×	?
Scolecophagus ferrugineus	×	......	......	Steganopus wilsoni	×	×	?
Scolecophagus cyanocephalus	×	×	×	Fuligula vallisneria	×	......	......
Quiscalus purpureus	×	×	×	Bucephala islandica	......	......	×
Pica hudsonica	......	×	×	Histrionicus torquatus	......	......	×

The list herewith is restricted to the birds actually observed and generally shot.

There remains the agreeable duty of witnessing the ready and unvarying courtesy extended to the Naturalist of the Commission by Mr. Campbell and Major Twining, who sought to aid by all means in their power the scientific interests he had in charge; and by Captain W. F. Gregory, Corps of Engineers, U. S. A., to whose party he was attached during the season of 1874.

TURDUS (PLANESTICUS) MIGRATORIUS, *Linn.*

THE ROBIN.

Found in abundance at Pembina, where it was breeding in the wooded river-bottom. In this latitude, the eggs are generally laid during the middle and latter parts of June, and I scarcely think that more than one brood is reared annually. Further westward the species seems to occur chiefly during the migrations, as most of the country is unsuited to its wants. In September, large numbers were observed in the fringes of trees along the Mouse River. During the second season, the birds were again found on the Upper Missouri River and in the Rocky Mountains. On the whole, the species is much less numerous, excepting in the immediate valley of the Red River, than it is in settled and wooded portions of the United States, and probably none pass the winter in this latitude.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2953	♂	Pembina, Dak	June 12, 1873	Elliott Coues.				Skin.
2954	♀	....do	......do	....do				....do.
2985		....do	June 14, 1873	....do				Egg.
3117		....do	June 22, 1873	....do				....do.
3126		....do	June 23, 1873	... do				Three eggs.
3130		....do	June 24, 1873	....do				Nest with 5 eggs.
3131		....do	......do	....do				Nest: young in alcohol.
3756		Mouse River, Dak	Sept. 16, 1873	....do				Skin.

TURDUS (HYLOCICHLA) PALLASI, *Cab.*

HERMIT THRUSH.

The Hermit Thrush was not observed during the Survey until toward the close of the second season, when specimens were taken in the Rocky Mountains near Chief Mountain Lake, under circumstances which left no doubt of its breeding in the vicinity. As it is, however, a common species of wide distribution in North America, it is doubtless to be found, like the Robin, wherever timber grows, along the line of the Northern Boundary.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4531	....	Rocky Mountains, latitude 49°.	Aug. 20, 1874	Elliott Coues.	......	......	......	Skin.
4606	....	....do	Aug. 25, 1874	....do	......	......	......	....do.

TURDUS (HYLOCICHLA) SWAINSONI, *Cab.*

Olive-backed Thrush.

The remarks made under head of the last species, with regard to geographical distribution, are equally applicable to the present one. It was only observed, however, in September, during the general autumnal migration, in the slight fringe of trees along the stream where I was collecting at the time. In a country so nearly treeless as is the tract lying between the Red River and the Rocky Mountains, the slightest pieces of woodland are eagerly sought by all the migrants as stopping-places for food and rest. Though at other seasons tenanted by few species, they become populous in the fall by the presence of great numbers of small insectivorous and granivorous species, among which the *Turdidæ*, *Sylvicolidæ*, and *Fringillidæ* are conspicuous.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3759	....	Mouse River, Dak ..	Sept. 16, 1873	Elliott Coues.	7. 50	12. 10	3. 80	Skin.

TURDUS (HYLOCICHLA) FUSCESCENS, *Steph.*

Veery, or Wilson's Thrush.

Unlike either of the preceding species, the Veery does not appear to extend westward beyond the Valley of the Red River,—at any rate, it was only observed in the vicinity of Pembina. Here it was found breeding in abundance during the month of June, when its exquisite song enlivened the tangled recesses of the wooded river-bottom, in which the timid birds secreted themselves, and formed one of the most characteristic pieces of bird-melody to be heard in that ill-favored locality. A nest was found on the 9th of June, containing four fresh eggs, uniform, bluish-green in color, and measuring about 0.86 in length by 0.66 in diameter. It was placed upon a small heap of decayed leaves which had been caught on the foot-stalks of a bush a few inches from the ground, and composed of weed-stems, grasses, and fibrous bark-strips, woven together, and mixed with withered leaves. The walls were thick, giving a bulky, irregular, and rather slovenly appearance, and causing the cavity to appear comparatively small,—it was only about 2½ inches in diameter by less than 2 inches in depth, though the whole nest was as large as a child's head.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2927	♀	Pembina, Dak	June 9, 1873	Elliott Coues	......	......	......	Skin, with nest and 4 eggs.
2955	....	....do	June 12, 1873	....do	......	......	......	Skin.
2978	....	....do	June 14, 1873	....do	7.75	12.25	......	....do.

MIMUS CAROLINENSIS, (*Linn.*) *Gray*.

CATBIRD.

The Catbird was ascertained to be one of the common species of the Red River region, where it was breeding in June, in situations similar to those it selects in the East. I traced it westward to Turtle Mountain, but did not observe it again in the Rocky Mountains, where its presence was to have been expected. It is also a rather common species on the Upper Missouri and the northern affluents of this and of the Milk River. The Missouri appears to be the highway by which the species gains the Rocky Mountains, as observed by Dr. Hayden. The naturalists of the Northwest Boundary Commission collected specimens in Washington Territory, and Sir John Richardson has left a record of its occurrence in the Saskatchewan region as far north as latitude 54° north. As at Pembina, the bird was breeding in June in the shrubbery along the Upper Missouri and its tributaries.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2958	....	Pembina, Dak	June 13, 1873	Elliott Coues.	......	......	......	Nest with 4 eggs.
3061	....	....do	June 19, 1873	....do	......	......	......	Nest with 2 eggs.
3114	....	....do	June 22, 1873	....do	......	......	......	Three eggs.
3127	....	....do	June 23, 1873	....do	......	......	......	Two eggs.
3217	....	....do	June 30, 1873	....do	......	......	......	Nest with 5 eggs.
3352	....	Turtle Mountain, Dak.	July 23, 1873	....do	......	......	......	Skin.
4024	....	Big Muddy River, Mont.	June 22, 1874	....do	......	......	......	Skin; nest with 3 eggs.
4025	....	....do	......do	....do	......	......	......	Skin.

HARPORHYNCHUS RUFUS, (*Linn.*) *Cab.*

THRASHER, or BROWN THRUSH.

Observed at Pembina, which appears to be near the northern limit of the distribution of this species. In other latitudes, however, it extends further westward, having been found by earlier expeditions in various portions of Dakota, Nebraska, Wyoming, and Colorado. It is one of the species of *Turdidæ* which does not appear to leave the United States in winter, as we have no West Indian or Central American quotations. It breeds in suitable localities anywhere within general range. A nest containing four eggs was found at Pembina late in June.

During the second season, the species was observed on the Missouri above Fort Buford.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3084	....	Pembina, Dak	June 21, 1873	Elliott Coues.	......	......	......	Nest with 4 eggs.
......	....	Near Fort Buford, Dak.	July —, 1874	....do	......	......	......	(Not preserved.)

CINCLUS MEXICANUS, *Sw.*

AMERICAN DIPPER, OR WATER OUZEL.

During the tedious march through the monotonous country of the Milk River, when little was to be looked for that had not already been found, I daily indulged pleasant anticipations of change for the better, in the new and more varied features of the avifauna which I should meet on entering the mountains. I was particularly desirous of finding the Dipper,—a bird that in former years had given me the slip when I was crossing the mountains of New Mexico and Arizona. Nor was I disappointed; the most favorable conditions of the bird's existence are met in the many crystal cascades, fed by the snow-capped peaks that form Chief Mountain Lake,—a beautiful sheet of water environed by precipitous mountains, debouching with a tortuous course into one of the many clear streams that unite to form the Saskatchewan. Nor was this romantic spot the home of the Dipper alone, among the more interesting forms of animal life. The Bohemian Waxwing was breeding here, many degrees of latitude further south than had been known before. So was the Harlequin Duck, like the Waxwing then for the first time ascertained to rear its young within the limits of the United States. Barrow's Golden Eye and other species, to me, at least, extremely interesting, were here first encountered, as more fully noted in other portions of this narrative.

At the time of my visit, it was too late to look for the nest or eggs of the Dipper, as the young were already on wing; that they were bred in the immediate vicinity, at an altitude of only about 4,000 feet, was evident from the immature condition of the specimens examined.

My observations upon the habits of the species were too limited to enable me to add anything to the account, compiled from various sources, which was published in the "Birds of the Northwest".

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
1545	....	Rocky Mountains, latitude 49°.	Aug. 21, 1874	Elliott Coues.	......	......	......	Skin.

SIALIA ARCTICA, *Sw.*

ROCKY MOUNTAIN BLUEBIRD.

The Northern Boundary appears to be slightly beyond the limit of distribution of the Eastern Bluebird, since the species was not observed at Pembina, where the avifauna is almost entirely Eastern in its composition. The Western Bluebird, *S. mexicana*, is still further removed from the region now under consideration. The third and only other species of this country has a more northerly distribution than either of the others, reaching to about latitude 64° or 65° north; it is found from the eastern foothills of the Rocky Mountains to the Pacific, and in some localities is very abundant. A few individuals were observed by the Commission in the Rocky Mountains, at Chief Mountain Lake, but no specimens were preserved. Its habits are much the same as those of its well-known Eastern congener.

REGULUS CALENDULA, *Licht.*

RUBY-CROWNED KINGLET.

This species, of general distribution throughout the wooded portions of North America, was observed on Mouse River, in September, during the autumnal migration, frequenting the dense undergrowth of the river-bottom in company with *Helminthophaga celata* and *Dendrœca coronata.* In its spring and autumn movements, it undoubtedly passes the several wooded points of the line, and may yet be found breeding in the mountains in this latitude.

Its nest and eggs long remained among the special desiderata of American ornithologists. So far as known, no authentic specimens reached our hands until two or three years ago, when Mr. J. H. Batty, then attached to Dr. Hayden's Survey, discovered a nest in Colorado, July 21, 1873. It was placed on a spruce bough, about 15 feet from the ground, and contained five young and one egg. The structure, which I have examined at the Smithsonian, is larger than such a tiny architect would be expected to produce, and consists of a loosely blended mass of hair and feathers, mixed with moss and short pieces of straw. Other observers, notably Mr. T. M. Trippe, had previously indicated the undoubted breeding of the species in the higher wooded portions of Colorado, which is confirmed by the discovery of this nest.

It is a very curious fact, in the history of this genus, that a variety of *Regulus calendula*, or a very closely allied species, should be among the few resident birds which constitute the isolated fauna of the island of Guadeloupe, 200 miles south of San Diego, Cal.

PARUS ATRICAPILLUS SEPTENTRIONALIS, *Harris.*

LONG-TAILED CHICKADEE.

An abundant resident of the region of the Upper Missouri, in all suitable situations; but neither this nor any other species of the genus was noticed in the Red River Valley. It is the characteristic form of the whole Rocky Mountain region from the Fur Countries into Mexico, where it is the only representative of the genus, excepting *P. montanus.*

Detailed measurements of a series of specimens of this disputed form, for comparison with those of *P. atricapillus*, will be found in my work already quoted. These were carefully made in the flesh, at Fort Randall, during the winter of 1872–73. The average length was found to be 5.50 inches; the wing, 2.40 to 2.75; and the tail, 2.60 to 2.80.

A specimen procured at Chief Mountain Lake is preserved among the collections of the Commission.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4634	....	Rocky Mountains, lat. 49°.	Aug. 28, 1874	Elliott Coues	......	......	......	Skin.

TROGLODYTES AËDON, *Vieill.*

HOUSE WREN.

Observed as far west as the confines of the Missouri Coteau. The westernmost specimens, as well as those from the immediate valley of the Red River, appear to be typical *aëdon.* The Eastern form has also occasionally been met with in the Missouri region itself; though there the prevailing type is the var. *parkmanni.*

On the Red River, in June, the species was breeding very abundantly in the neighborhood of the fort and town of Pembina.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2791	....	Pembina, Dak	June 2, 1873	Elliott Coues	4.90	6.70	......	Skin.
3104	....	....do	June 22, 1873	....do	......	......	......	....do.
3115	....	....do	..... do......	....do	......	......	......	Nine eggs (2 sets).
3132	....	....do	June 24, 1873	....do	......	......	......	Nest with 5 eggs.
3173	....	....do	June 26, 1873	....do	......	......	......	Five eggs.
3727	....	Mouse River, Dak ..	Sept. 3, 1873	....do	......	......	......	Skin.
3744	....	Long Coteau River, Dak.	Sept. 11, 1873	....do	5.00	6.75	......	....do.

CISTOTHORUS STELLARIS, (*Licht.*) *Cab.*

SHORT-BILLED MARSH WREN.

The present is one of a few species of general distribution in the Eastern Province, which appears much more abundant along its line of migration in the Mississippi Valley than on the Atlantic coast. In the East, the species does not appear to have been observed beyond Southern New England. The present specimens, secured at Pembina in June, and later in the season along the Mouse River, are the northernmost on record, probably representing about the limit of its distribution in this quarter. The species has been observed westward to the Loup Fork of the Platte. I found the birds to be rather plentiful along the Red River, in low, oozy ground overgrown with scrub willows, and also in the reedy sloughs of the prairie. They were undoubtedly breeding here, though no nests were secured.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2910	♂	Pembina, Dak	June 4, 1873	Elliott Coues.	4.50	5.75	......	Skin.
3451	....	Mouse River, Dak ..	Aug. 9, 1873	....do	.....	......	......	....do.

TELMATODYTES PALUSTRIS, (*Wils.*) *Cab.*

LONG-BILLED MARSH WREN.

This species was not observed till we reached the Rocky Mountains, when a few were seen on marshy ground near Chief Mountain Lake. It is, however, of undoubted occurrence in suitable situations along the Line.

EREMOPHILA ALPESTRIS LEUCOLÆMA, *Coues.*

WESTERN HORNED LARK.

One of the most interesting points in the history of the Horned Lark is its peculiar distribution during the breeding-season. Its breeding-range is in no way related to zones of latitude, nor yet is it determined by altitude, but by the topographical features of the country. It rarely, if ever, stops to breed along the Atlantic coast so far south as New England, where the surface of the country is not adapted to its peculiar wants. It is stated to occasionally nest in portions of Canada West; but it is not until we reach the valley of the uppermost Mississippi, in a broad sense, that we find the bird regularly breeding within the United States. I am informed by Mr. W. K. Lente, who accompanied the expedition during the season of 1873, that it nests in Wisconsin, near Racine, laying about the middle of April, even before the snow is off the ground.

From the Red River and corresponding longitude, west to the Rocky Mountains, it breeds in profusion, and during the greater part of the year it is, without exception, the most abundant, universally diffused, and characteristic species of the prairie avifauna. Numerous specimens were taken, not only along the parallel of 49°, but also on the Missouri and Milk Rivers, and the species accompanied our line of march into the mountains. The individuals bred in this dry and sterile region are usually lighter-colored than those of better-watered areas, and are those which I have designated by the term *leucolæma*, in indication of a slight geographical differentiation.

The Horned Lark is one of the few species which, in this latitude, usually rear at least two broods each season,—a fact which in part accounts for the preponderance of individuals over those of the species with which they are associated. I have already adverted to the extremely early nesting-time which has been ascertained, and have only to add that the period of reproduction is protracted through July. I have observed young birds on the wing in June, and found fresh eggs in the nest during the latter half of July. In fact, all through the summer months the troops of Larks everywhere to be seen consist of old birds mixed with the young in all stages of growth. The great flocks, however, are not usually made up until the end of the summer, when all the young are full-grown, and the parents, having concluded the business of rearing their young, have changed their plumage. The young of the first brood soon lose the peculiar speckled plumage with which they are at first covered; the later ones change about the time the feathers of the old birds are being renewed. The agreeable warbling song is scarcely to be heard after June.

While it is not probable that any of these birds endure the full rigors of winter in the exposed country of this latitude, I am unable to say when they retreat. They continue abundant until October, and probably only retreat before the severe storms of the following month, to return again in March, if not in February. It is brave and hardy, one of the few birds that weather the terrible storms that usually prevail in April in the Missouri region.

The nest of the Horned Lark may be stumbled upon anywhere on the open prairie. It is a slight affair,—merely a shallow depression in the ground, lined with a few dried grass-stems. The eggs are four or five in number, measuring nearly an inch in length by about three-fifths in breadth; they are very variable in contour. The color is well adapted to concealment in the gray-brown nest, being nearly the color of the withered materials upon which they rest, thickly and uniformly dotted with light brown. The eggs and young birds, like those of other small species nesting on the ground in this region, often become the prey of the foxes, badgers, and weasels, if not also of the gophers.

The Horned Lark is a sociable bird, not only highly gregarious with its own kind, but one that mixes indiscriminately with several other species, as Sprague's Lark, the Savanna Sparrow, Baird's, Maccown's, and the Chestnut-collared Buntings, all of which are abundant birds of the same region.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3747	....	Mouse River, Dak	Sept. 12, 1873	Elliott Coues.	......	......	......	Skin.
3855	....	....do	Oct. 1, 1873	....do	7.60	13.90	4.50	....do.
3856	....	....do	......do	....do	7.40	13.75	4.50	....do.
3857	....	....do	......do	....do	7.30	13.50	4.30	....do.
4097	....	Porcupine R., Mont	June 29, 1874	....do	......	......	......	Skin, hairy (young).
4150	....	Frenchman's River, Mont.	July 7, 1874	....do	......	......	......	Skin.
4151	....	....do	......do	....do	......	......	......	....do.
4157	♂	....do	July 8, 1874	....do	......	......	......	....do.
4158	....	....do	......do	....do	......	......	......	....do.
4159	....	....do	......do	....do	......	......	......	....do.
4245	♀	Two Forks Milk R., Mont.	July 18, 1874	....do	......	......	......	Skin (parent of eggs, same No.).
4246	....	....do	......do	....do	......	......	......	Skin.
4247	....	....do	......do	....do	......	......	......	....do.
4252	....	N'r Two Forks Milk River, Mont.	July 21, 1874	....do	......	......	......	....do.
4253	....	....do	......do	....do	......	......	......	....do.
4323	....	Sweetgrass Hills, Mont.	Aug. 6, 1874	J. H. Batty	6.50	14.75	4.00	....do.
4335	....	West of Sweetgrass Hills, Mont.	Aug. 7, 1874	Elliott Coues.	......	......	......	....do.
4345	....	....do	Aug. 8, 1874	....do	......	......	......	....do.
4423	....	....do	Aug. 12, 1874	....do	......	......	......	....do.
4424	....	....do	......do	....do	......	......	......	....do.
4464	....	Headwaters Milk R., Mont.	Aug. 15, 1874	....do	......	......	......	....do.
4470	....	....do	......do	....do	......	......	......	....do.
4471	....	....do	......do	....do	......	......	......	....do.
4621	....	Rocky Mts., latitude 49°.	Aug. 26, 1874	J. H. Batty	......	......	......	....do.
4666	....	West of Sweetgrass Hills.	Aug. 30, 1874	....do	......	......	......	....do.
4667	....	....do	......do	....do	......	......	......	....do.
4668	....	....do	......do	....do	......	......	......	....do.
4669	....	....do	......do	....do	......	......	......	....do.
4674	....	....do	......do	....do	......	......	......	....do.
4682	....	....do	Aug. 31, 1874	Elliott Coues.	......	......	......	....do.
4683	....	....do	......do	....do	......	......	......	....do.
4684	....	....do	......do	....do	......	......	......	....do.
4685	....	....do	......do	....do	......	......	......	....do.
4686	....	....do	......do	....do	......	......	......	....do.
4687	....	....do	......do	....do	......	......	......	....do.
4688	....	....do	......do	....do	......	......	......	....do.
4689	....	....do	......do	....do	......	......	......	....do.
4690	....	....do	......do	....do	......	......	......	....do.

ANTHUS LUDOVICIANUS, *(Gm.) Licht.*

TITLARK, OR PIPIT.

In the general area surveyed by the Commission, the Titlark appears to be only a bird of passage, in spring and autumn. During the first season I accompanied the Survey, none were observed until September, when, with arrival of various other species from the north, they made their appearance in considerable numbers along the Mouse River. The following season, however, I found them in August about Chief Mountain Lake, and do not doubt that those then observed were bred in the immediate vicinity, as at that time the fall migration had not commenced. In the Eastern Province, the Pipit agrees closely with the Horned Lark in its distribution during the breeding-season; in the

West, however, the case is reversed, the *altitudes* at which it nestles being complementary to the latitude it elsewhere seeks for the same purpose. It nests abundantly in the Rocky Mountains, above timber-line, along with the Ptarmigan, as first determined by Mr. J. A. Allen, and subsequently very fully set forth by Mr. T. M. Trippe, at pp. 231, 232, of the "Birds of the Northwest". Its general habits as observed in the West furnish no occasion for special comment.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3704	....	Mouse River, Dak ..	Sept. 2, 1873	Elliott Coues	6. 60	10. 40	3. 20	Skin.
4638	....	Rocky Mountains, latitude 49°.	Aug. 29, 1874	....do	......	......	......	....do.
4639	....	...do	.....do	....do	......	......	......	....do.

NEOCORYS SPRAGUII, (*Aud.*) *Scl.*

MISSOURI SKYLARK.

This very interesting bird, which in this country represents the celebrated Skylark of Europe, was discovered by Audubon in 1843, during his trip to the Upper Missouri. His type specimen, secured at Fort Union, June 19, is still preserved in the National Museum, having been among the many rare or unique specimens presented by him many years ago to Professor Baird. For about twenty years, no other specimens were forthcoming, and little, if anything more, was heard of the bird until an English officer, Captain Blakiston, met with it in considerable numbers in the Saskatchewan region, and contributed an account of its habits, as observed by him, to the "Ibis", then, as now, one of the very few journals devoted to ornithology. One of his specimens, like Audubon's original, reached the Smithsonian Institution, and remained until recently the only duplicate known to exist in any American collection. During my connection with the Boundary Commission I passed the season of 1873 in the very centre of abundance of the species, and collected over fifty specimens, all of which reached Washington safely and in good condition. Many more could have been secured, but I considered this number sufficient, not only for my own study of the species, but for distribution among other ornithologists, and various public collections in this country and Europe. During the same summer, my friend J. A. Allen, who was similarly engaged in field-work south of me, in the Yellowstone region, in connection with an engineering expedition then in progress, also became familiar with the bird, collected many specimens, and had the good fortune to discover the nest and eggs. These latter, now in the National Museum, are the only specimens, so far as I know, which have come under the notice of naturalists since Audubon first discovered them. I transcribe the account which he courteously furnished me for publication in a different connection:—

"The only nest we found was placed on the ground, and neatly formed of fine dry grass. It was thinly arched over with the same material, and being built in a tuft of rank grass, was most thoroughly concealed. The bird would seem to be a close setter, as in this case the female remained on the nest till I actually stepped over it, she brushing against my feet as she went off. The eggs were five in number, rather long and pointed, measuring about 0.90 by 0.60 inches; of a grayish-white color, thickly and minutely flecked with darker, giving them a decidedly purplish tint."

It is a natural step from the nest and egg to the young. On the 2d of August, 1873, while encamped at Turtle Mountain, I discovered a brood of four newly fledged young birds, and captured the whole family, the mother bird being also secured. The little ones were still unable to fly, and would doubtless have escaped observation had it not been for the anxiety of the parents, whose disturbed actions and querulous complaints led to their detection. The nest was doubtless within a few yards of my tent, but after careful and repeated search I had to give it up. The young birds, upon gaining their first full plumage, differ materially from the adults. The upper parts have a richer cast, owing to the buffy edgings of the feathers; those of the back and scapulars have also narrow, sharp, white tips, forming a set of semicircular markings. The greater coverts and longest inner wing-feathers are likewise broadly white-tipped. The buffy-brown patch formed by the ear-coverts is also more conspicuous than it is in the adults. The under parts, excepting the throat and middle of the belly, are strongly tinged with buff, while the streaks on the breast and sides are large, numerous, and diffuse.

A more exact description of the adults than is usually found in treatises may be here reproduced. The sexes are alike, though the male averages a little larger than the female. In addition to the dimension given in the table which succeeds this article may be given those of other parts. The tail is about $2\frac{1}{3}$ inches; bill $\frac{1}{2}$ an inch along the culmen, which is a little concave toward the base. The bill as a whole is weak, slender, compressed, and acute. Tarsus, measured in front, $\frac{4}{5}$ to $\frac{9}{10}$; hind toe and claw $\frac{4}{5}$ to 1, the variation depending chiefly upon the length of the hind claw, which differs a good deal in different individuals; eye black; feet pale flesh-color (neary colorless); upper mandible black, the lower pale flesh-color; upper parts dark brown streaked with pale gray, the baldness of the pattern corresponding with the size of the feathers, since the streaking constitutes the edging of each one; under parts dull whitish or very pale clay-color, washed with a heavier or lighter shade of brown across the breast and along the sides, these same parts being sharply streaked with blackish; there is also a series of small black streaks on each side of the throat; quills of the wings fuscous, the inner ones and the coverts edged with grayish-white, like the feathers of the upper parts; outermost two pairs of tail-feathers for the most part white, and the third feather usually also with a touch of white near the end; the middle pair colored like the back. During the wear of the feathers in summer, the bird becomes darker on the upper parts, the grayish-white edgings of the feathers narrower and sharper, and the streaks on the breast become fainter. After the fall moult, the general colors become purer and brighter, with stronger variegation on the upper parts and a ruddier brown wash on the lower. But these variations, however obvious to the ornithologist's eye, do not prevent ready recognition of the species. The bird bears some little resemblance to the common Titlark, its general form being much the same; but the latter never shows the decidedly variegated state of plumage which renders the present species unmistakable.

If I am not mistaken, the range of the Missouri Skylark extends into Minnesota, and I have seen a record to that effect; but I cannot at this moment recall the reference or lay my hand on the article. I did not see the bird in the immediate vicinity of the Red River, and do not think I should have overlooked it had any individuals been breeding about Pembina, where I was every day in the field for more than a month collecting very assiduously. Passing the low range of the Pembina Mountains, however, I at once entered the prairie region, where it was breeding in great numbers, in company with Baird's and the Chestnut-collared Buntings. The first one I shot, July 14, was a bird of the year, already full-grown and on wing, and as I found scarcely fledged young at least a month later, I judge that, like the *Eremophila*, the bird raises two broods a year. Travelling westward to and beyond the second crossing of the Mouse River, no day passed that I did not see numbers of the birds; and at some of our camps, notably that at the first crossing of the Mouse River, they were so numerous that the air seemed full of them; young ones were caught by hand in the camp, and many might have been shot without stirring from my tent, as they hovered overhead on tremulous wings, uttering continuously their sharp querulous cry. They continued abundant through the greater part of September, in which month the renewal of the plumage is completed, and some still remained on the ground until October. Exactly when they migrate, however, and where they go to, or when they return, are equally unknown to me,—not the least singular point in the bird's history is the success with which it has eluded observation during the winter months. It is not to be supposed that so delicate a bird is capable of enduring the rigors of winter in this inclement region; and yet, so far as I know, no one has found it in winter, at which season it surely *ought* one would suppose, to be generally distributed in more southerly portions of the West.*

On reaching Fort Buford the following season, I naturally expected to find the Skylarks equally abundant; for this was the spot where the original victim fell to Audubon's—rather, I understand, to Mr. Isaac Sprague's—gun. But in this I was disappointed, for in the whole region up to the mouth of the Milk River, I only noticed perhaps a few hundred, and, to my surprise, not a single bird of the kind did I see anywhere along the line of march through the Milk River country, until I came to the headwaters of that river, two or three days' journey from the Rocky Mountains, where, on the 13th of August, a single specimen was secured. There is nothing in the general range of the species to account for this, since the bird, as Mr. Allen has informed us, is common in the Yellowstone region; it must be attributed to some peculiarity of local distribution, or fortuitous default of observation.

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* A specimen was lately taken at Galveston, Tex., in March, by Mr. George B. Sennett. See this Bulletin, this Vol., No. 1, p. 10.

The general habits and manners of these birds are very much like those of their nearest allies, the Titlarks. During the breeding-season, as usual, it is dispersed in pairs over the country; but, like many other prairie birds, it has its predilection for certain spots, especially in the vicinity of the streams, where many pairs gather in straggling companies, and loose troops are seen together as soon as the first broods are on wing. Such semi-communism is a conspicuous trait of many species not strictly gregarious; but in the present case, after the duties of incubation are entirely finished, larger flocks, acting upon the same impulses, are frequently observed. Were it not for their great abundance, there would be some trouble in securing large numbers, for there are few birds more difficult to shoot upon the wing, while their colors, assimilating with the rusty herbage of the prairie, effectually conceal them when on the ground. When startled, they rise with a rapid, wayward flight, which often defies the most expert marksman. Their ordinary hovering flight, again, though not rapid, is of the peculiarly devious, desultory, and jerky character which renders a sure aim almost impossible, just as it is in the case of a bat, for instance; the instantaneous snap shot, which is one of the prettiest exhibitions of a sportsman's acquired instincts, is alone likely to be successful. After thus hovering on wing for a time, during which the lisping, plaintive note is continually uttered, the birds are wont to pitch suddenly down to the ground again, often upon the very spot whence they arose, and are then immediately lost to view, even among the scantiest herbage of the prairie. On the ground, as on the wing, their actions are precisely like those of Titlarks: they never hop with both feet, like most kinds of Sparrows, but run with one foot after the other, tripping along with mincing steps, and continually vibrating the tail, which seems as if jointed with an elastic hinge. They have a fancy for frequenting the wagon-roads which cross the boundless expanse of prairie, perhaps finding the worn ruts smoother and easier to walk upon, perhaps attracted by insects which the disturbance of the surface exposes, or by the droppings of the draught animals which have passed along.

But the most interesting portion of the natural history of these birds is their charming song, and the wonderful soaring action during its delivery. The music is heard only during a brief period—in the love season, when the birds are mating and nesting; at other times they have only the sibilant chirp already noted. The bird soars on high till it is but a speck in the blue ether, even until it is lost to view, and then the matchless song descends as if from another world, while its indescribable effect is heightened by the monotonous and often dreary surroundings of the scene. The song continues with scarcely an intermission for several minutes, before the little performer, setting his wings, glides quietly back to his humble home in the grass; and when, as often happens, several are singing within hearing of each other, the whole air seems filled with melody, and vibrating in accord with the harmonious strains. Such concerts as these, to which I have listened for nearly a month together, are among the most delicious pieces of bird-melody to be heard anywhere, and their memory is to me one of the choicest of the many pleasurable experiences that have been mine in the years I have devoted to my favorite pursuits.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3260	..	20 miles west of Pembina Mts., Dak.	July 14, 1873	Elliott Coues.	6.50	11.25	3.30	Skin.
3302	..	75 miles west of Pembina Mts., Dak.	July 17, 1873	....do	6.30	10.40	3.10	....do.
3314	...	25 miles east of Turtle Mt., Dak	July 18, 1873	...do	6.40	10.50	3.15	...do.
3315	....	....do	......do	...do	6.50	10.90	3.25	....do.
3316	♂	....do	......do	...do	6.30	10.50	3.20	....do.
3317	....	.. do	......do	...do	6.60	11.00	3.30	....do.
3318	...	....do	......do	...do	6.50	10.80	3.20	....do.
3319	♀	....do	......do	...do	6.40	10.90	3.15	...do.
3397	♀	Turtle Mt., Dak	Aug. 2, 1873	....do	6.25	10.25	3.05	Skin (parent of Nos. 3398-3401).
3398	...	....do	......do	....do	......	......	......	
3399	...	....do	......do	....do	......	......	......	Skin (nestling).
3400	....	....do	......do	...do	......	......	......	....do.
3401	....	....do	......do	...do	......	......	......	....do.
3421	♀	Mouse River, Dak	Aug. 9, 1873	....do	6.60	10.75	......	...do.
3422	♀	....do	......do	....do	6.75	11.15	......	Skin.
3423	....	....do	......do	...do	6.75	11.10	......	....do.
3424	....	....do	......do	...do	6.50	10.85	......	....do.
3425	♂	....do	......do	....do	6.75	10.90	......	....do.
3426	♂	....do	......do	....do	6.80	11.20	......	....do.
3427	....	....do	......do	....do	6.50	10.75	......	....do.
3428	....	....do	......do	....do	6.70	11.25	......	....do.
3429	....	....do	......do	....do	6.60	11.00	......	....do.
3430	....	....do	......do	...do	6.30	10.35	......	... do.
3431	....	... do	......do	....do	6.50	10.50	......	....do.
3432	....	....do	......do	...do	6.50	10.60	......	....do.
3433	....	....do	......do	....do	6.50	10.75	......	....do.
3434	....	....do	......do	....do	6.35	10.50	......	....do.
3435	....	....do	......do	....do	6.75	10.90	......	....do.
3472	...	... do	Aug. 10, 1873	....do	......	......	......	....do.
3483	...	....do	Aug. 11, 1873	....do	6.80	11.00	......	....do.
3484	...	....do	......do	...do	6.70	10.60	......	...do.
3485	...	....do	......do	....do	6.50	10.50	......	....do.
3486	..	....do	......do	....do	6.50	10.50	......	....do.
3487	...	....do	......do	....do	6.70	10.70	......	....do.
3493	....	....do	Aug. 13, 1873	....do	6.50	10.25	......	....do.
3494	....	....do	......do	....do	6.80	11.30	......	....do.
3495	..	...do	......do	....do	6.65	10.60	......	... do.
3496	....	....do	......do	....do	6.75	11.10	......	....do.
3497	....	....do	......do	....do	7.00	11.50	......	....do.
3498	....	....do	......do	....do	6.50	10.75	......	....do.
3499	..	....do	......do	....do	6.60	10.85	......	....do.
3500	....	....do	......do	....do	6.50	10.65	......	....do.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3501	♂	Mouse River, Dak ..	Aug. 13, 1873	Elliott Coues	6. 75	11. 25	......	Skin.
3502	...	....do	......do	....do	6. 65	10. 85	......	....do.
3503	....	....do	......do	....do	6. 75	11. 00	......	....do.
3504	....	....do	......do	....do	6. 65	10. 90	......	....do.
3505	♂	....do	......do	.. do	6. 50	11. 00	......	....do.
3506	....	....do	......do	....do	6. 40	10. 40	......	....do.
3542	....	....do	Aug. 19, 1873	....do	......	......	......	....do.
3705	♂	....do	Sept. 2, 1873	....do	6. 30	10. 80	......	....do.
3706	....	....do	......do	....do	6. 50	11. 20	......	....do.
3850	....	....do	Oct. 1, 1873	....do	6. 50	10. 80	3. 30	....do.
4440	....	Headwaters Milk River, Mont.	Aug. 13, 1874	....do	6. 40	10. 50	3. 30	....do.

MNIOTILTA VARIA, (*L.*) *Vieill.*

BLACK-AND-WHITE CREEPER.

A single specimen was taken at Pembina, where it probably breeds, though the fact was not ascertained. Not found further west. In the Missouri region, it has not been traced beyond old Fort Pierre, where Dr. Hayden some years since observed it.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2919	....	Pembina, Dak	June 9, 1873	Elliott Coues.	......	......	......	Skin.

HELMINTHOPHAGA PEREGRINA, (*Wils.*) *Cab.*

TENNESSEE WARBLER.

Upon my arrival at Pembina, the beginning of June, I at once perceived that the vernal migration of the present species past this point was about to be concluded. This was evidenced by the great disproportion of the sexes, for out of thirteen specimens secured and examined only three proved to be males. In this case, as in many others, the males lead the van during the migration, the females bringing up the rear a little later. Such preponderance of females, taken among specimens indiscriminately secured, is a pretty sure indication that the migration is in progress; for when the birds stop, and begin breeding, many more of the active and musical males than of the quiet, shy, and unobtrusive females will be likely to be observed, as was strikingly illustrated on the same spot by the Mourning Warblers. Another indication of the rapid progress of the migration was the steady current, so to speak, of these birds that flowed along the waters of the river itself. The general course of the river is nearly due north and south, and it thus forms a convenient and attractive highway of migration, along which numerous woodland species pass. I accounted for the great abundance of such birds at this point by the fact that the whole country to the westward being open, and, therefore, unsuited to their wants, a condensation, or a sort of thickened, folded-over edge of the species here occurred. As long as the migration lasted, the heavy timber of the river-bottom was filled with the birds in a steady stream. There was no occasion to go in search of specimens; stationing myself in some eligible spot, I had only to take them as they came along, fluttering from tree to tree, pursuing insects with a sharp, scraping note, yet never long delaying their onward course. With the second week in June they had all, so far as I know, passed northward; certainly I found no indication of any remaining to breed in this locality.

The species was not observed further west in this latitude, though it has been traced high up the Missouri by other persons. It was named *Sylvicola missouriensis* in 1858 by Maximilian, the late Prince of Wied.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2778	♀	Pembina, Dak	June 2, 1873	Elliott Coues	5.00	7.75	......	Skin.
2779	♀	....do	......do	... do	4.75	7.75	......	....do.
2819	♀	...do	June 3, 1873	....do	4.75	7.50	......	....do.
2820	♀	....do	......do	....do	4.75	7.75	......	....do.
2821	♂	....do	......do ...	....do	4.60	7.70	......	....do.
2822	♀	....do	......do	....do	4.90	7.50	......	....do.
2823	♀	....do	......do	....do	4.60	7.40	......	....do.
2824	♀	....do	......do	... do	4.80	7.50	....	....do.
2825	♀	....do	......do	....do	4.70	7.50	......	....do.
2826	♀	....do	......do	....do	4.90	7.70	......	... do.
2827	♀	....do	......do	....do	4.75	7.40	......	....do.
2828	♂	....do	......do	....do	4.90	8.00	......	....do.
2829	♂	....do	......do	....do	4.90	7.90	......	....do.

HELMINTHOPHAGA CELATA, (*Say*) *Bd.*

ORANGE-CROWNED WARBLER.

Observed during the fall migration, in September, along the Mouse River, where it was abundant.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3761	....	Mouse River, Dak ..	Sept. 16, 1873	Elliott Coues	5.20	7.60	2.30	Skin.
3779	....	....do	Sept. 18, 1873	....do	......	......	......	....do.
3780	....	....do	......do	....do	5.00	7.75	2.40	....do.
3781	....	....do	......do	....do	4.80	7.50	2.35	...do.
3782	....	....do	......do	....do	......	......	......	....do.
3794	....	....do	Sept. 19, 1873	... do	......	......	......	....do.
3801	....	....do	Sept. 22, 1873	....do	4.80	7.00	2.30	....do.
3802	....	....do	......do	....do	5.00	7.60	2.50	....do.
3803	....	....do	......do	....do	4.90	7.40	2.45	....do.
3840	....	....do	Sept. 30, 1873	....do	4.80	7.60	2.40	....do.

DENDRŒCA ÆSTIVA, (*Gm.*) *Bd.*

YELLOW WARBLER.

This abundant and universally diffused species was observed at various points along the whole line, and in the Missouri region.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2784	♂	Pembina, Dak	June 2, 1873	Elliott Coues.	5.00	7.75	.....	Skin.
2785	♂	....do	......do	...do	5.10	7.70	.....	....do.
2786	♀	....do	......do	...do	4.90	7.50	......	....do.
2813	♀	...do	June 3, 1873	...do	......	......	......	Alcoholic.
2844	♂	....do	June 4, 1973	...do	5.00	7.75	......	....do.
2845	....	....do	... ..do	...do	......	......	....	....do.
2846	...	....do	......do	...do	4.90	7.60	......	....do.
2895	....	....do	June 6, 1873	...do	......	.....	......	Skin.
3564	...	Mouse River, Dak ..	Aug. 23, 1873	.. do	......	......	......	....do.
4445	♀	Headwaters Milk River, Mont.	Aug. 14, 1874	J. H. Batty...	......	....	......	....do.

DENDRŒCA CORONATA, (*Linn.*) *Gray.*

YELLOW-RUMPED WARBLER.

Not observed until about the middle of September, when, during the fall migration, it made its appearance in abundance along the Mouse River, in company with the Snowbirds and other species just come from the north. It is one of the Warblers which, though distinctively belonging to the Eastern Province, occasionally straggles southward by a direct line from the extreme western points which it reaches in Alaska. Drs. Cooper and Suckley found it in Washington Territory; Dr. Hayden, up the Missouri to above old Fort Pierre; and Mr. C. E. Aiken, Mr. T. M. Trippe, and Mr. H. W. Henshaw have each found it in Colorado Territory. Its breeding-range is not a little remarkable: it has been recorded as breeding in Jamaica, as well as in various parts of British America and Alaska, but is not known to nest in the greater part of the intervening country. Similarly, in winter, some individuals endure the rigors of the Middle, if not of some of the Northern, States, while others press on into Central America. No other Warbler, as far as known, has such a peculiar distribution as this.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3768	....	Mouse River, Dak ..	Sept. 16, 1873	Elliott Coues.	......	......	......	Skin.
3769	....	....do	..... do.....	....do	......	......	.....	....do.
3783	....	....do	Sept. 18, 1873	....do	......	......	......	...do.

DENDRŒCA AUDUBONI, (*Towns.*) *Bd.*

AUDUBON'S WARBLER.

Audubon's Warbler was only observed in the Rocky Mountains, beyond the eastern foothills of which it is not known to extend. From the Rocky Mountains to the Pacific, it is as abundant, in suitable localities, as the Yellow-rump is in most parts of the East, and its counterpart in habits. The individuals found about Chief Mountain Lake did not appear to be migrating,—in fact, the full movement had not begun at the period of observation,—and the species doubtless breeds in this locality in the heavy pine timber.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4556	....	Rocky Mountains, lat. 49°.	Aug. 22, 1874	Elliott Coues.	......	......	......	Skin.
4557	....	....do	..... do......	...do	....	.....	....	....do.
4558	....	....do	..... do......	. do	......	.....	......	....do.

DENDRŒCA STRIATA, (*Forst.*) *Bd.*

BLACK-POLL WARBLER.

A specimen of this species, procured on Woody Mountain, was observed in the collection made by Mr. G. M. Dawson, geologist of the English Commission.

DENDRŒCA PENNSYLVANICA, (*Linn.*) *Bd.*

CHESTNUT-SIDED WARBLER.

One specimen only of this distinctively Eastern specimen was secured at Pembina,—perhaps its western, if not also nearly its northern, limit. It was not observed beyond the Red River. This is one of the more delicate species of the genus, which regularly breeds little, if any, beyond the Northern States, and entirely withdraws in winter, reaching Central and even South America. I have not found any indication of its occurrence west of the longitude of the Red River in any latitude.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2814	♀	Pembina, Dak	June 3, 1873	Elliott Coues.	5.00	7.70	......	Skin.

DENDRŒCA MACULOSA, (*Gm.*) *Bd.*

BLACK-AND-YELLOW WARBLER.

Specimen from Woody Mountain, seen in Mr. Dawson's collection.

SIURUS NÆVIUS, (*Bodd.*) *Coues.*

WATER THRUSH.

During the progress of the Northwest Boundary Survey, with which the work of the present Commission connected, the Water Thrush was observed in Washington Territory; and since that time its very general range throughout North America has been demonstrated, though the bird was long supposed to be, like *S. motacilla*, a species of the Eastern Province. A specimen was secured in August west of the Sweetgrass Hills, on the headwaters of Milk River. This was the only individual procured during the expedition, and seemed to be somewhat out of place, since the species frequents, for the most part, moister and better-wooded regions. It was again observed, however, in the undergrowth surrounding some reedy pools near Chief Mountain.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4430	....	West of Sweetgrass Hills, Mont.	Aug. 12, 1874	Elliott Coues	......	.....	......	Skin.

GEOTHLYPIS TRICHAS, (*Linn.*) *Cab.*

MARYLAND YELLOW-THROAT.

Observed at Pembina, on Turtle Mountain, and in the Rocky Mountains, but not in the open country between these points. The species is one of general distribution in the United States in all suitable localities, and appears to breed indifferently in any latitude within these limits. The Northern Boundary may be not far from the line of its dispersion in this direction.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2878	♂	Pembina, Dak	June 5, 1873	Elliott Coues	......	.....	....	Skin.
3373	♂	Turtle Mountain, Dak	July 28, 1873	.. do	....	....	......	.... do.
3374	♀	....do	..... do......	....do	......	....	......	... do.
4620	...	Rocky Mountains, lat. 49°.	Aug. 26, 1874	J. H. Batty ..	....	....	......	....do.

GEOTHLYPIS PHILADELPHIA, (*Wils.*) *Bd.*

MOURNING WARBLER.

I was agreeably surprised to find this species, which is rather rare in most Eastern localities, breeding abundantly at Pembina; and I suspect that the Mississippi Valley, rather than the Atlantic seaboard, may be the principal line of migration along which it comes from its winter home in Central America to its breeding resorts along the northern boundary of the United States. At the end of June I found a nest, supposed to be of this species, but the identification was not at all satisfactory. The birds were breeding in June, as I knew by the different actions of the two sexes. The males were in full song, and, contrary to their very secretive habits during most of the year, became rather conspicuous, not only by their singing, but by their custom of leaving the dense shrubbery and undergrowth, in which they usually hide, to mount to the tops of the trees. The females, on the other hand, were extraordinarily quiet and retiring; so much so, that during the whole month I secured not a single specimen, though nearly a dozen males were taken without much difficulty. The birds were only observed in the heavy timber of the river-bottom in this locality, and were not afterward encountered during our progress westward; whence I suppose this is about the limit of their Western dispersion. The species appears to breed in like numbers in various portions of Minnesota, where Mr. T. M. Trippe has found it haunting the tamarack swamps and adjoining damp thickets. He corroborates the habit I have just mentioned of ascending to the tree-tops; and, like myself, was unfortunate in finding no nest, though he frequently saw the old birds feeding their young in the latter part of June and early in July. The song is a loud, clear, and agreeable warble, reiterated with great persistency.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2775	♂	Pembina, Dak	June 2, 1873	Elliott Coues	5. 25	7. 75	....	Skin.
2776	♂	...do	..... do......	.. do	5. 30	7. 70	....	....do.
2777	♂	....do	..... do	....do	5. 25	7. 70	....	....do.
2876	♂	....do	June 6, 1873	.. do	5. 40	8. 10	.....	...do.
2877	♂	...co	..... do.....	....do	5. 30	7. 75	....	....do.
2920	♂	.. do	June 9, 1873	....do	5. 30	7. 90	....	....do.
2935	♂	...do	June 11, 1873	.. do	5. 25	7. 75	.....	....do.
2968	♂	...do	June 13, 1873	.. do	5. 50	7. 70	.....	... do.
3219	....	...do	June 30, 1873	....do	.....	.....	......	Nest with 1 egg (?).

GEOTHLYPIS PHILADELPHIA MACGILLIVRAYI, (*Aud.*) *Bd.*

MACGILLIVRAY'S WARBLER.

A single specimen was secured in the Rocky Mountains in August. 's latitude at least, the present bird does not appear to approach the range of its Eastern conspecies within several hundred miles, though further south the two may approach each other more closely. The typical *macgillivrayi*, however, has been recorded from Boxelder Creek, one of the tributaries of the Missouri above the mouth of the Yellowstone.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4561	....	Rocky Mountains, latitude 49°.	Aug. 23, 1874	Elliott Coues.	5.50	7.90	2.50	Skin.

ICTERIA VIRENS, (*Linn.*) *Bd.*

YELLOW-BREASTED CHAT.

No Chats were observed at Pembina, nor anywhere along the parallel of 49°, and it may well be doubted whether the species ever quite reaches this latitude. Its absence from the Red River Valley is in striking contrast to its abundance and general dispersion in the Missouri region, but a comparatively short distance to the southward and much further west. In the Atlantic States it barely reaches into Southern New England. I found it during the second season up the Missouri to beyond the mouth of the Yellowstone.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
4022	♂	Big Muddy River, Mont.	June 22, 1874	Elliott Coues	......	....	......	Skin.

MYIODIOCTES PUSILLUS, (*Wils.*) *Bp.*

BLACK-CAPPED FLY-CATCHING WARBLER.

A species of general distribution in North America, and doubtless occurring at all suitable points along the Line, though only actually observed near the eastern base of the Rocky Mountains.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4449	....	Headwaters Milk River, Mont.	Aug. 14, 1874	J. H. Batty...	....	......	......	Skin.

SETOPHAGA RUTICILLA, (*Linn.*) *Sw.*

REDSTART.

Very abundant at Pembina, where it breeds. Early in June, the birds exhibited the incessant activity which marks the mating season, and were conspicuous in the sombre foliage of the dense timber along the river, no less by the brilliancy of their black, white, and red plumage, than by their noisiness and sprightly actions. Their characteristic habits of expanding and flirting the tail, and running sideways along the twigs of trees, and their wonderful agility in the pursuit of flying insects, are all particularly well displayed at this season.

Though I did not myself observe the species further westward along the Line, nor anywhere in the Missouri region, it has been traced by others, especially by Dr. J. G. Cooper, along the Upper Missouri and Milk Rivers, and thence to the Cœur d'Alêne Mountains. It is also known to occur in Colorado and Utah.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2783	♂	Pembina, Dak	June 2, 1873	Elliott Coues	4.75	7.60	......	Skin.
2804	♀	....do	June 3, 1873	....do	.....	......	......	....do.
2805	♀	.. do	......do	.... do	......	......	......	....do.
2806	♀	....do	......do	.... do	......	......	......	....do.

HIRUNDO ERYTHROGASTRA HORREORUM, (*Barton,*) *Coues.*

BARN SWALLOW.

I find no specimens of this species entered in my register from Pembina, where, according to my recollection, it was not breeding at the time of my visit, though the family was there well represented by numbers of Cliff and White-bellied Swallows. Nevertheless, Barn Swallows were commonly observed, during July and August, at various points along the Line, nearly to the Rocky Mountains. Eligible breeding-places for this species being few and far between in this country, it is correspondingly uncommon, at least in comparison with its numbers in most settled districts. A small colony of the birds which had located for the summer on a small stream west of the Sweetgrass Hills afforded me an opportunity of observing a curious modification of their nesting-habits, which I believe had not been known until I published a note upon the subject. The nests were built in little holes in the perpendicular side of a "cut-bank",—whether dug by the birds themselves or not I could not satisfy myself, though I am inclined to think that they were. My assistant, Mr. Batty, seemed to feel quite confident in the matter; and the probability is, that if the holes were not wholly made by the birds, they were at least fitted up for the purpose.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
....	....	Mouse River, Dak..	Aug. 30, 1873	Elliott Coues	......	......	......	Skin.
4298	....	Crossing of Milk River, Mont.	July 25, 1874	...do	......	......	......	....do.
4328	....	West of Sweetgrass Hills, Mont.	Aug 10, 1874	....do	......	......	......	....do.

TACHYCINETA BICOLOR, (*Vieill.*) *Cab.*

WHITE-BELLIED SWALLOW.

Only observed at Pembina, where it was breeding in small numbers about the Fort, together with large colonies of Cliff Swallows.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3056	♂	Pembina, Dak	June 19, 1873	Elliott Coues.	......	....	......	Skin.

TACHYCINETA THALASSINA, (*Sw.*) *Cab.*

VIOLET-GREEN SWALLOW.

Observed on one occasion (June 26, 1874) on the Upper Missouri near Quaking Ash River.

PETROCHELIDON LUNIFRONS, (*Say*) *Scl.*

CLIFF SWALLOW.

This is the most abundant, generally distributed, and characteristic species of the family throughout the region under consideration. The various streams that cut their devious ways through the prairie afford an endless succession of steep banks exactly suited to its wants during the nesting-season, and at various places great clusters of the curious bottle-nosed mud-nests were found, while the flocks of Swallows which often hung about our camps were mainly composed of this species. At some points, the Bank Swallows were breeding with them; the same banks being peppered with their little round holes, generally in the soft soil just below the surface, while the projecting nests of the Cliff Swallows studded the harder or rocky exposures below. At Fort Pembina, the Cliff Swallows were so numerous as to become a nuisance; their incessant twittering was considered a bore, while the litter they brought and their droppings resulted in a sad breach of military decorum. Nevertheless, it was found almost impossible to dislodge them, and one could not but

AMPELIS CEDRORUM, (*Vieill.*) *Gray.*

CEDAR BIRD; CAROLINA WAXWING.

Not seen at Pembina but found at various other points along the Line, and ascertained to be particularily abundant in the Rocky Mountains. At this locality, two of its conspicuous traits were illustrated, namely, the lateness and the irregularity of its breeding. On the same day, August 19, that I took young birds fully fledged and on wing, a nest containing four eggs was found by one of my assistants, Mr. A. B. Chapin. This might be interpreted upon the supposition that two broods are reared in a season, but I do not think that such was the case in the present instance: the bird is too late a breeder for this, at any rate in such a high latitude, not far from its northernmost limit of its distribution.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
3541	♀	Mouse River, Dak	Aug. 19, 1873	Elliott Coues				Skin.
3721		do	Sept. 3, 1873	do				do.
3732		Long Coteau River, Dak.	Sept. 8, 1873	do				do.
4524		Rocky Mountains, latitude 49°.	Aug. 19, 1874	do				Skin (young).
4526		do	do	A. B. Chapin				Nest with 4 eggs.
4532		do	Aug. 20, 1874	do				Skin.
4559		do	Aug. 22, 1874	J. H. Batty				do.
4560		do	do	do				do.
4561		do	do	do				do.
4562		do	do	do				do.
4563		do	do	do				do.

VIREO OLIVACEUS, (*Linn.*) *Vieill.*

RED-EYED VIREO.

Abundant at Pembina, where it was breeding in June, and again on the Upper Missouri between Fort Buford and the mouth of the Milk River. Though characteristically a bird of the Eastern Province, it has latterly been traced to the Rocky Mountains and somewhat beyond. The late Dr. C. B. R. Kennerly found it in Washington Territory, and Mr. J. A. Allen at Ogden, Utah.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2807	♂	Pembina, Dak	June 3, 1873	Elliott Coues.	6.30	10.10		Skin.
2808	♀	do	do	do	5.90	9.50		do.
2809	♂	do	do	do	6.25	10.00		do.
2859	♀	do	June 5, 1873	do	6.00	9.70		do.
2860	♀	do	do	do	5.90	9.40		do.
2861	♀	do	do	do	6.00	9.75		do.
2889	♂	do	June 6, 1873	do	6.00	10.30		do.
2925	♀	do	June 9, 1873	do	5.75	9.90		do.
2926	♀	do	do	do	5.90	10.20		do.
2937	♂	do	June 11, 1873	do				do.
2966	♂	do	June 13, 1873	do				do.

VIREO PHILADELPHICUS, *Cass.*

BROTHERLY-LOVE VIREO.

This appears to be a species which, like the Mourning Warbler and some others, is more abundant in the interior, and especially in the Mississippi Valley, than in the Atlantic States. It was originally described, a few years since, from the vicinity of Philadelphia, as indicated by its name, and has been justly esteemed as rather a rare bird in the Eastern and Middle States, though its great similarity to *V. gilvus* may be a cause of its being partially overlooked. In New England, it has been found on two or three occasions, and Dr. Brewer informed me of its abundance in Wisconsin during the latter part of May. Mr. T. M. Trippe in querying *V. gilvus* as found by him in Minnesota, probably had the present species in view. It undoubtedly breeds about Pembina, in the heavy timber of the river-bottom, but I was not so fortunate as to discover its nest, a circumstance the more to be regretted since neither the nest or eggs have as yet come to light.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2811	♂	Pembina, Dak	June 3, 1873	Elliott Coues	5. 10	8. 50	......	Skin.
2812	♀	...do	.... do	...do	4. 80	7. 80	.....	....do.

VIREO GILVUS, (*Vieill.*) *Bp*

WARBLING VIREO.

Observed in abundance at Pembina, and again found at the opposite extremity of the Line, the specimen captured in the Rocky Mountains, however, being probably of the slight variety *swainsoni*. At Pembina, the Warbling Vireo was in full song and breeding in June. A nest found on the 11th of that month was still empty; but in this latitude few of the small insectivorous birds appear to lay before the third week in June.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2810	♀	Pembina, Dak	June 3, 1873	Elliott Coues	5. 60	8. 50	......	Skin.
2890	♂	....do	June 6, 1873	....do	6. 00	9. 10	......	....do.
2923	♀	....do	June 9, 1873	....do	5. 30	8. 60	......	...do.
2933	....	....do	June 11, 1873	....do	......	......	......	Nest.
4519	....	Rocky Mountains, latitude 49°.	Aug. 19, 1874	....do	......	......	......	Skin (var. *swainsoni*).

VIREO SOLITARIUS, (*Wils.*) *Vieill.*

SOLITARY VIREO.

One specimen of this rather rare species was secured at Pembina, which is probably about its northern limit. It was taken in the timber of the river-bottom, frequented by three other species of the same genus.

A fifth species of Vireo, the White-eyed, probably also occurs in the same locality, since it has been found in Minnesota. It was not, however, observed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2839	....	Pembina, Dak	June 4, 1873	Elliott Coues	5.50	9.25	......	Skin.

COLLURIO LUDOVICIANUS EXCUBITORIDES, (*Sw.*) *Coues.*

WHITE-RUMPED SHRIKE.

This is the characteristic species of the whole region explored,—the larger kind, *C. borealis*, probably only occurring during its migration to or from the north, and in winter; at any rate, it was not observed. The White-rumped Shrike is common in suitable localities, and numerous specimens were secured at different points. At Turtle Mountain, during the last week in July, I found a family of these birds in an isolated clump of bushes. The young, four in number, had just left the nest, which was discovered in the crotch of a bush, five or six feet from the ground. It was one of the dirtiest nests I have ever handled, being fouled with excrement, and with a great deal of a scurfy or scaly substance, apparently cast from the feathers of the young during their growth. The nest proper rested upon a bulky mass of interlaced twigs; it was composed of some white weed that grew abundantly in the vicinity, matted together with strips of fibrous bark.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2774	♂	Pembina, Dak	June 1, 1873	Elliott Coues	......	......	......	Skin.
2983	♂	....do	June 14, 1873	....do	8.60	12.40	......	....do.
2984	♀	....do	......do	....do	8.60	12.40	......	....do.
3385	....	Turtle Mountain, Dak.	July 30, 1873	....do	......	......	......	....do.
3386	....	....do	......do	...do	......	......	......	....do.
3387	....	....do	......do	....do	......	......	......	....do.
3391	....	....do	July 31, 1873	....do	......	......	......	....do.
4506	....	Rocky Mountains, latitude 49°.	Aug. 17, 1874	....do	......	......	......	....do.
4640	....	....do	Aug. 29, 1874	....do	......	......	......	....do.

CARPODACUS PURPUREUS, (*Gm.*) *Gray.*

PURPLE FINCH.

This species was found in small numbers on Turtle Mountain during the latter part of July. It doubtless breeds in this locality. It has been traced by other observers as far as the region of the Saskatchewan, but I did not find it in the Rocky Mountains, nor, indeed, anywhere along the Line, excepting in the locality just mentioned. In the Missouri region, I have ascertained that it ascends the river as far at least as Fort Randall,—how much further I am unable to say; the evidence of its presence above that point being negative, with the exception of Dr. Hayden's record of a specimen from Vermilion River.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3368	♀	Turtle Mountain, Dak.	July 28, 1873	Elliott Coues	......	......	......	Skin.

CHRYSOMITRIS TRISTIS, (*Linn.*) *Bp.*

AMERICAN GOLDFINCH.

This familiar bird was noted only at Pembina. It is, however, a species of general distribution in North America, so that the lack of observation respecting it at other points is to be regarded as simply fortuitous.

While upon the small subgroup of the *Fringillidæ* to which the present species belongs, I may properly note some other kinds which undoubtedly belong to the avifauna of the Boundary Line, though they escaped my observation. These are chiefly winter visitors from the north,—for it will be remembered that I was in the field, during both seasons, only from June to October.

The Pine Grosbeak, *Pinicola enucleator*, the two Cross-bills, *Loxia americana* and *L. leucoptera*, the Gray-crowned finch, *Leucosticte tephrocotis*, and the Red-poll Linnet, *Ægiothus linaria*, all enter this country later in the fall, some to remain during winter, others to pass further on; while the Pine Linnet, *Chrysomitris pinus*, is a species of the same general distribution as the Goldfinch.

Of the genus *Plectrophanus*, next to be considered, all the North American species occur in this region, which is the very home of two ot them; two others came southward just as I was leaving, the 1st of October; and the fifth, the Snow Bunting, *P. nivalis*, which was the only one not seen, doubtless came along shortly afterward.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2830	♂	Pembina, Dak	June 4, 1873	Elliott Coues	5.10	9.00	......	Skin.

PLECTROPHANES LAPPONICUS, (*Linn.*) *Selby.*

LAPLAND LONGSPUR.

On one of the last occasions when, during the season of 1873, I used my gun for collecting, a single specimen of the Lapland Longspur was secured. I think that the species had just reached the parallel on its southward movement; otherwise I could hardly have failed to observe it sooner, as I was shooting almost every day. Exactly how far south it may linger to breed I do not know, but there are some indications that it may occasionally nest in this latitude. Nevertheless, it ordinarily reaches the Arctic regions in summer; and I have seen the nest and eggs from an island in Behring's Sea. It moves southward in October in large flocks, reaching at least as far as Kentucky and Colorado. It does not appear to have been found in the United States west of the Rocky Mountains, but this may be merely through default of observation, since it is a species of circumpolar distribution, like the Snow Bunting, abundant in northern portions of Asia and Europe. Such casual observations as I made when the specimen was secured showed nothing specially different in its habits from either *P. pictus* or *P. ornatus*, with both of which it was associated.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3851	....	Mouse River, Dak...	Oct. 1, 1873	Elliott Coues	6.50	11.25	3.70	Skin.

PLECTROPHANES PICTUS, *Sw.*

PAINTED LONGSPUR.

Observed only on one occasion, when it was found in company with the Chestnut-collared and Lapland Longspurs, having probably, like the last species, just arrived from the north. The two autumnal (young) specimens secured closely resemble the corresponding plumage of *P. ornatus*, though the birds are readily distinguished by certain marks. *P. pictus* is the larger of the two (length, 6.50; extent, 11.25; wing, 3.75; tail, 2.50; tarsus, 0.75; middle toe and claw the same). Upper parts much as in the adults in summer, but the distinctive head-markings obscure or wanting. Entire under parts buff or rich yellowish-brown, paler on the chin and throat, which, like the forebreast, are obsoletely streaked with dusky. Tibiæ white. Two or three outer feathers of the tail only white. Bill dusky-brown above and at the end, paler below. Feet light brown, toes darker. In no stage of plumage of *P. ornatus* are the under parts extensively buffy, while all the tail-feathers, excepting perhaps the middle pair, are white at the base.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3853	♂	Mouse River, Dak...	Oct. 1, 1873	Elliott Coues	6. 50	11. 20	3. 75	Skin.
3854	♀	....do	.......do	....do	6. 40	11. 00	3. 55	....do.

PLECTROPHANES ORNATUS, *Towns.*

CHESTNUT-COLLARED LONGSPUR.

These birds were not noticed in the immediate valley of the Red River; but no sooner had I passed the Pembina Mountains than I found them in profusion. Throughout this part of the country they are wonderfully abundant, even exceeding in the aggregate either Baird's Bunting or the Missouri Skylark. Their numbers continued undiminished to the furthest point reached by my party during the first season—the head-waters of Mouse River—and they were still in the country when I left, the second week in October. The next season I noticed but few along the Upper Missouri and Lower Milk River, where P. *maccowni* became abundant; they were more common along Frenchman's River, but some little distance further westward I lost sight of them, and in a letter transmitted to the "American Naturalist", from the Two Forks of Milk River, I was induced to suppose I had got beyond their range; this, however, proved not to be the case, for subsequently I saw them at intervals till I entered the foothills of the Rocky Mountains. The interesting relation between the habitat of this species and of *P. maccowni* is more fully expressed under head of the latter; here I will only advert to its great abundance in the whole Red River watershed west of that river itself, its sudden falling-off in numbers at the point where the Coteau de Missouri crosses 49°, yet its persistence westward to the Rocky Mountains.

My first specimens were secured July 14, 1873, at which date the early broods were already on wing. Uniting of several families had scarcely begun, however, nor were small flocks made up, apparently, till the first broods had, as a general thing, been left to themselves, the parents busying themselves with a second set of eggs. Then straggling troops, consisting chiefly of birds of the year, were almost continually seen, mixing freely with Baird's Buntings and the Skylarks; in fact, most of the congregations of the prairie birds that were successively disturbed by our advancing wagon-trains consisted of all three of these, with a considerable sprinkling of Savanna Sparrows, Shore Larks, and Bay-winged Buntings. The first eggs I secured were taken July 18, nearly a week after I had found young on wing; these were fresh; other nests examined at the same time contained newly hatched young. Again, I have found fresh eggs so late as the first week in August. During the second season, the first eggs were taken July 6, and at that time there were already plenty of young birds flying. The laying-season must consequently reach over a period of at least two months. I was not on the ground early enough to determine the commencement exactly; but supposing a two weeks' incubation, and about the same length of time occupied in rearing the young in the nest, the first batches of eggs must be laid early in June to give the sets of young which fly by the first of July. There is obviously time for the same pair to get a second, if not a third, brood off their hands by the end of August; I should say that certainly two, and probably three, broods are reared, as a rule. The result of all this is, that from the end of June until the end of August young birds in every state of plumage, and the parents in various degrees of wear and tear, are all found together. The young males very soon show some black on the under parts, but do not gain the distinctive head-markings until the next season. The completion of general moult is delayed until September, to nearly the time the Prairie Chickens have theirs; with its completion, both old and young acquire a much clearer and richer plumage than that worn during the summer. While the summer adults rarely show the bend of the wing black, this feature comes out strongly in September. Comparatively few of the birds of this region show the mahogany-color on the under parts, described as being very conspicuous in those of some other portions of the country. Many of the females, in high plumage, are scarcely distinguishable from the males. The extent of white on the tail is a conspicuous feature when the birds are flying, serving for their instant recognition among their allies. There is a good deal of variation in dimensions, as indicated by the measurements given in the table beyond.

The nest, of course, is placed on the ground, usually beneath some little tuft of grass or weeds, which effectually conceals it. Like that of other ground-building sparrows, it is sunk flush with the surface of the ground, thin at the bottom, but with thicker and tolerably firm brim; it consists simply of a few grasses and weed-stems, for the most part circularly disposed. In size, the cup is about 3½ inches across the brim and nearly 2 in depth. During the first season, I only found four eggs or young in a nest; but I afterward took one containing six eggs. These measure about ⅘ long by ⅗ broad, of an ordinary shape. They are difficult to describe as to color, for the marking is intricate as well as very variable here as elsewhere in the genus. I have called them "grayish-white, more or less clouded and mottled with pale purplish-gray, which confers the prevailing tone; this is overlaid with numerous surface markings of points, scratches, and small spots of dark brown, wholly indeterminate in distribution and number, but always conspicuous, being sharply displayed upon the subdued ground color." On those occasions when I approached a nest containing eggs, the female usually walked off quietly, after a little flutter, to some distance, and then took wing; at other times, however, when there were young in the nest, both parents hovered close overhead, with continuous cries.

During the summer, when the old birds are breeding, and those of the year are still very young, they are very familiar and heedless, and will scarcely get out of the way. In September, when the large flocks make up, and are joined by *P. pictus* from the north, they become much wilder, fly more strongly, and are then procured with some difficulty. I never observed the dense flocking that some writers describe; the congregation I always found to be a straggling one, so that single birds only could be shot on the wing. In the winter, however, or during the migration, the case may be different. The ordinary flight is perfectly undulatory, and not very rapid; but in the fall the birds have a way of tearing about, when startled, with a wayward course, which renders them difficult to shoot on the wing. The ordinary call-note is a chirp, of peculiar character, but not easy to describe; besides this, the males during the breeding-season have a pleasing twittering song, uttered while they are flying. The chirp is usually emitted with each impulse of the wings. The birds scatter indiscriminately over the prairie, but are particularly fond of the trails made by buffalo or by wagon-trains, where they can run without impediment, and where doubtless they find food which is not so accessible upon undisturbed ground. Though so generally distributed, there are some spots where they are particularly numerous, and others again, where, for no assignable reason, they are not to be seen. This curious sort of semi-colonization is witnessed in the cases of many other prairie birds, and some of the smaller rodent mammals, like the pouched gophers and field-mice.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3255	....	20 miles west Pembina Mts.	July 14, 1873	Elliott Coues.	5.90	10.70	......	Skin.
3256	....	....do	.....do	....do	5.75	10.30	......	....do.
3257	....	....do	.....do	....do	5.80	10.40	......	....do.
3258	...	... do	.....do	....do	6.00	10.65	......	....do.
3259	....	....do	.....do	....do	5.75	10.00	......	....do.
3261	..	....do	.....do	....do	5.70	10.15	......	....do.
3262	....	....do	.....do	....do	5.75	10.00	......	....do.
3286	....	50 miles west Pembina Mts.	July 15, 1873	....do	6.00	10.50	......	....do.
3287	....	...do	.....do	....do	6.20	10.60	......	....do.
3297	....	....do	July 16, 1873	....do	5.80	9.60	......	....do.
3327	♀	25 miles east Turtle Mt.	July 18, 1873	....do	......	......	......	Skin, with nest and 4 eggs.
3328	♂	....do	.....do	....do	......	......	......	Skin.
3329	♂	....do	.....do	....do	......	......	......	....do.
3330	....	....do	.....do	....do	......	......	......	....do.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3331		25 miles east Turtle Mt.	July 18, 1873	Elliott Coues				Skin.
3332		do	do	do				do.
3333		do	do	do				do.
3447		Moose River, Dak	Aug. 9, 1873	do				do.
3448		do	do	do				do.
3449		do	do	do				do.
3450		do	do	do				do.
3453		do	Aug. 10, 1873	do				Skin (young).
3465	♀	do	do	do	5.75	10.25		Skin.
3466		do	do	do	5.80	10.35		do.
3467		do	do	do	6.25	10.75		do.
3468		do	do	do				do.
3469		do	do	do				do.
3470		do	do	do				do.
3473		do	do	do				do.
3474		do	do	do	6.00	10.25		do.
3492		do	Aug. 11, 1873	do	6.00	10.50		do.
3516		do	Aug. 13, 1873	do	6.25	10.90		do.
3517		do	do	do	6.10	10.65		do.
3518		do	do	do	6.30	11.00		do.
3519		do	do	do	6.10	10.60		do.
3520		do	do	do	5.90	10.25		do.
3521		do	do	do				do.
3522		do	do	do				do.
3523		do	do	do				do.
3524		do	do	do				do.
3525		do	do	do				do.
3552		do	Aug. 22, 1873	do				do.
3568		do	Aug. 23, 1873	do				do.
3569		do	do	do				do.
3588		do	Aug. 27, 1873	do				do.
3709	♂	do	Sept. 2, 1873	do	6.25	10.80	3.30	do.
3710	♂	do	do	do	6.25	10.80	3.30	do.
3711	♀	do	do	do	5.90	10.35	3.20	do.
3712		do	do	do				do.
3713	♀	do	do	do	5.80	10.20	3.20	do.
3714		do	do	do	5.50	10.10	3.10	do.
3715		do	do	do				do.
3722		do	Sept. 3, 1873	do				do.
3723		do	do	do				do.
3724		do	do	do				do.
3725		do	do	do				do.
3726		do	do	do				do.
3733	♂	Long Coteau River, Dak.	Sept. 8, 1873	do	6.10	10.70	3.40	do.
4137	♂	Frenchman's River, Mont.	July 6, 1874	do				do.
4138	♀	do	do	do				Skin, with set of 6 eggs.
4140	♂	do	July 7, 1874	do				Skin.
4141	♂	do	do	do				do.
4142	♂	do	do	do				do.
4143	♂	do	do	do				do.
4144	♀	do	do	do				do.
4145		do	do	do				do.
4146		do	do	do				do.
4165	♂	do	July 8, 1874	do				do.
4166	♂	do	do	do				do.
4167	♂	do	do	do				do.
4168	♂	do	do	do				do.
4169	♂	do	do	do				do.
4170	♂	do	do	do				do.
4171	♀	do	do	do				do.
4172		do	do	do				do.
4173		do	do	do				do.
4293		Crossing of Milk River, Mont.	July 25, 1875	do				do.
4294		do	do	do				do.
4300		do	do	do				do.
4404		West Sweetgrass Hills, Mont.	Aug. 11, 1874	do				do.
4432		Headwaters Milk River, Mont.	Aug. 13, 1874	J. H. Batty	5.75	10.25	3.25	do.
4434		do	do	do				do.

PLECTROPHANES MACCOWNI, *Lawr.*

BLACK-BREASTED LONGSPUR.

This species was never seen in the Red River region, and I do not think it occurs in that watershed, which is so thickly populated in summer with *P. ornatus*, as already described. It seems to be one of the many birds that mark the natural division between that region and the Missouri Basin. I first encountered it June 21, 1874, a day's march above Fort Buford. The specimen obtained was a young one, not quite able to fly. As we progressed toward the Milk River, the bird grew more and more abundant, and it occurred throughout the country thence to the Rocky Mountains. There were some points on the route where it was scarcely to be seen (as is usually the case with the small prairie birds); but this was a matter of slight local distribution, for the species was equally numerous, " in spots," throughout the country. *P. ornatus* accompanied it in some numbers about as far as Frenchman's River, where both species were breeding, and a few stragglers were noted along the whole way; but, in spite of this admixture, *P. maccowni* is to be considered the characteristic species of the genus in the Missouri watershed at this latitude, just as *P. ornatus* is in that of the Red River.

Maccown's Longspur was very abundant in the country about Frenchman's River, and equally so about the headwaters of Milk River and in the eastern foothills of the Rocky Mountains. It does not appear, however, to enter the mountains themselves, but stops just short of the beginning of the trees,—just where the *Spermophili* give way to the *Geomyidæ* and the Badgers to the Woodchucks. Of its periods of nidification and laying I am less precisely informed than in the case of *P. ornatus*. The fledgling taken June 21 indicates an early June brood, corresponding to the first one of *P. ornatus;* but I took no eggs after July 10, when the only set in the collection was secured. Young birds in all stages were common from this time until the latter part of August, and I have no doubt that at least two broods are reared each season. The nidification is substantially the same as that of *P. ornatus*. The few sets of eggs I have examined are of the same size as those of the bird just named, and closely resemble the lighter-colored varieties of the latter. The ground-color, however, is dull white, without the purplish-gray clouding so noticeable in the eggs of *P. ornatus*. The markings are rather sparse and obscurely mottled, with some heavier, sharper, scratchy ones, all of different shades of brown. According to analogy, it is reasonable to presume upon the same wide range of variation in this case that is known to obtain elsewhere in the genus *Plectrophanes*.

While the females are incubating, the males have a very pretty way of displaying themselves and of letting the music out at the same time. They soar to a little height, and then, fixing the extended wings at an angle of forty-five degrees with their bodies, sink slowly down to the

ground, singing most heartily—" sliding down the scale of their own music," as some one has happily expressed it in the case of another species of similar habit. This song, I think, is superior to that of the Chestnut-collared Bunting, though of the same general character. When hovering in the manner just indicated, both birds resemble butterflies,—there is something so light, wayward, and flickering in their motions.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4010		Big Muddy River, Mont.	June 21, 1874	Elliott Coues				Skin (nestling).
4147	♂	Frenchman's River, Mont.	July 7, 1874	do	6.25	11.25	3.50	Skin.
4148	♂	do	do	do	6.20	11.50	3.45	do.
4149	♂	do	do	do	6.00	11.10	3.40	do.
4160	♂	do	July 8, 1874	do	6.00	11.50	3.60	do.
4161	♂	do	do	do				do.
4162	♂	do	do	do	6.30	11.60	3.60	do.
4163	♂	do	do	do	6.00	11.00	3.40	do.
4164	♀	do	do	do	5.75	10.70	3.30	do.
4218	♂	Near Frenchman's River, Mont.	July 10, 1874	do				Skin, with 4 eggs.
4227	♂	Two Forks of Milk River.	July 16, 1874	do				Skin (parent of young in alcohol).
4228	♀	do	do	do				do.
4241	♂	do	July 18, 1874	do				Skin.
4242	♀	do	do	do				do.
4243		do	do	do				do.
4244		do	do	do				do.
4249		do	do	do				do.
4254	♀	Near Two Forks of Milk River.	July 21, 1874	do				do.
4255		do	do	do				do.
4261		Crossing of Milk River, Mont.	July 24, 1874	do				do.
4295		do	July 25, 1874	do				do.
4330	♂	West of Sweetgrass Hills, Mont.	Aug. 7, 1874	do				do.
4331		do	do	do				do.
4332		do	do	do				do.
4333		do	do	do				do.
4334		do	do	do				do.
4403		do	Aug. 11, 1874	do				do.
4425	♂	do	Aug. 12, 1874	do				do.
4426	♀	do	do	do				do.
4427		do	do	do				do.
4428		do	do	do				do.
4429		do	do	do				do.
4441		Headwaters Milk River, Mont.	Aug. 13, 1874	J. H. Batty				do.
4442		do	do	do				do.
4443		do	do	do				do.
4457		do	Aug. 15, 1874	do				do.
4458		do	do	do				do.
4459		do	do	do				do.
4460		do	do	do				do.
4461		do	do	do				do.
4466		do	do	Elliott Coues				do.
4467		do	do	do				do.
4468		do	do	do				do.
4469		do	do	do				do.
4472		do	do	do				do.
4473		do	do	do				do.
4474		do	do	do				do.
4498	♂	Near Rocky Mountains, lat. 49°.	Aug. 16, 1874	do				do.
4499	♂	do	do	do				do.
4500	♂	do	do	do				do.
4501	♂	do	do	do				do.
4502	♀	do	do	do				do.
4628	♀	do	Aug. 28, 1874	do				do.
4629		do	do	do				do.
4630		do	do	do				do.
4631		do	do	do				do.
4632		do	do	do				do.
4641	♂	do	Aug. 29, 1874	do				do.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4659	....	Headwaters Milk River, Mont.	Aug. 30, 1874	Elliott Coues	......	......	......	Skin.
4660	...	....do	.....do	....do	......	......	......	....do.
4661	....	...do	.....do	....do	......	......	......	....do.
4662	...	...do	.....do	....do	......	......	......	....do.
4663	....	...do	.....do	... do	......	......	......	....do.
4664	....	...do	.....do	....do	......	......	......	....do.
4665	.	...do	.....do	....do	......	......	......	....do.
4667	♂	West of Sweetgrass Hills, Mont.	Aug. 31, 1874	....do	......	......	......	....do.
4678	♂	....do	.....do	....do	......	......	......	....do.
4679	♂	....do	.....do	....do	......	......	......	....do.
4680	♂	....do	.....do	....do	......	......	......	... do.
4681	♀	....do	.....do	....do	......	......	......	....do.

PASSERCULUS BAIRDI, (*Aud.*) *Coues*.

BAIRD'S BUNTING.

It is difficult to understand how this bird eluded observation for thirty years—from the time of its original discovery by Audubon, on the Upper Missouri, nearly to the present day. If the species were really rare, this would not be remarkable; but it has lately been shown to be extremely abundant in different parts of the West. I did not meet with it along the Red River itself, but found it as soon as I passed from the Pembina Mountains to the boundless prairie beyond. In some particular spots, it outnumbered all the other birds together; and on an average through the country, from the Pembina Mountains to the Mouse River, it was one of the trio of commonest birds,—the Skylarks and Chestnut-collared Longspurs being the other two. The first specimens I procured were taken July 14. Some of them were newly fledged, but the great majority were adult males, showing that at that time the breeding-season was at its height. Out of thirty-one specimens secured July 14 and 15, only one was a female, the individuals of this sex being evidently occupied with the duty of incubating or brooding their young. The males at this time were very conspicuous, like *Spizella pallida* under the same circumstances, as they sat singing on the weeds or low bushes of the prairie. The song consists of two or three distinct syllables, followed by a trill uttered in a mellow, tinkling tone. The nest I never succeeded in finding, although I must have passed by many. The eggs were first discovered by Mr. Allen in the region just south of me. They were taken July 1, 1873, the date corresponding to that which I fixed as the laying season from consideration of the habits of the birds. The nest and eggs are described from his specimens in the "Birds of the Northwest". Whether or not two broods are reared, I cannot say; but some of my late summer specimens were so young that I judged they might belong to a second brood. Birds of apparently about the same age were shot six weeks apart.

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	do	do	do	[illegible]	[illegible]		do.
[illegible]	[illegible]	do	do	do	[illegible]	[illegible]		do.
[illegible]	[illegible]	do	do	do	[illegible]	9.35		do.
[illegible]	[illegible]	do	do	do	[illegible]	[illegible]		do.
[illegible]	[illegible]	do	do	do	[illegible]	9.50		do.
[illegible]		do	July 16, 1873	do				do.
[illegible]		do	do	do	5.50	9.35		do.
[illegible]		do	do	do	5.65	9.70		do.
[illegible]		do	do	do	5.65	9.30		do.
[illegible]		do	do	do	5.60	9.40		do.
[illegible]		do	do	do	5.65	9.30		do.
[illegible]		do	do	do	5.60	9.60		do.
[illegible]		75 miles west Pembina Mts.	July 17, 1873	do	5.40	9.50	2.90	do.
[illegible]		do	do	do	5.75	9.10	2.75	do.
[illegible]		do	do	do	5.50	9.40	2.80	do.
[illegible]		do	do	do	5.10	9.10	2.75	do.
[illegible]		25 miles east Turtle Mountain.	July 18, 1873	do				do.
[illegible]		do	do	do				do.
[illegible]		do	do	do				do.
[illegible]		do	do	do				do.
[illegible]		do	do	do				do.
[illegible]		do	do	do				do.
[illegible]		do	do	do				do.
[illegible]	[illegible]	Turtle Mt., Dak	July 25, 1873	do	5.25	9.40		do.
[illegible]	[illegible]	do	do	do	5.30	9.50		do.
[illegible]		Mouse River, Dak.	Aug. 9, 1873	do	5.65	9.20		do.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3437	....	Mouse River, Dak.	Aug. 9, 1875	Elliott Coues	5.50	8.60	......	Skin.
3438	....	do	do	do	5.50	9.00	......	do.
3439	....	do	do	do	5.75	9.30	......	do.
3440	...	do	do	do	5.70	9.00	......	do.
3441	....	do	do	do	5.50	9.00	......	do.
3464	♀	do	Aug. 10, 1873	do	....	....	......	do.
3488	....	do	Aug. 11, 1873	do	5.70	9.00	......	do.
3489	....	do	do	do	5.50	8.85	......	do.
3507	....	do	Aug. 13, 1873	do	5.80	9.75	......	do.
3508	....	do	do	do	5.50	9.10	......	do.
3509	....	do	do	do	5.65	9.35	......	do.
3510	....	do	do	do	5.65	9.35	......	do.
3511	....	do	do	do	5.65	9.30	......	do.
3512	....	do	do	do	5.50	9.25	......	do.
3513	....	do	do	do	5.60	9.25	......	do.
3514	....	do	do	do	5.65	9.45	......	do.
3515	....	do	do	do	5.75	9.30	......	do.
3849	....	do	Oct. 1, 1873	do	5.80	9.60	3.05	do.

COTURNICULUS LECONTII, (*Aud.*) *Bp.*

LeConte's Bunting.

The rediscovery of this little-known and extremely interesting species in Dakota was made in the season of 1873 by the Commission. On the march between Turtle Mountain and the first crossing of Mouse River, I came upon what seemed to be a small colony of the birds in a moist depression of the prairie, where the herbage was waist-high. By diligent search, after shooting the first specimen and perceiving what it was, I managed, not without difficulty, to secure five in all. This was on the 9th of August. I subsequently found the bird again, and secured a sixth specimen, amongst the reeds of a prairie slough near the headwaters of the river just mentioned. So far as I could determine from short observation, the birds are much like the *Ammodromi* in their general habits and appearance, and they inhabit similar situations. Their note was a chirring noise, like that of a grasshopper. They were started at random from the tall, waving grass, flitted in sight for a few seconds, and then dropped suddenly, so that the chances of shooting them were very poor. One was killed at very close range by a blow from the *wad* of my cartridge, the charge of shot having passed in lump close by. I have no doubt that the birds were breeding in this place, though no nests were found. Their retiring habits and the nature of their resorts have doubtless caused them to be overlooked for years. Audubon says that he found them common on the Upper Missouri. A specimen, in poor condition, from Texas, was the only one known to exist in any collection before these of mine were secured, Audubon's type having been lost or mislaid. A redescription of the species, in which it is shown that the characters originally assigned required modification, is given in the "Birds of the Northwest".

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3442	♂	Mouse River, Dak.	Aug. 9, 1873	Elliott Coues.	5.00	7.10	......	Skin.
3443	♀	....do	......do	....do	5.00	7.00	......	....do.
3444	....	....do	......do	....do	5.00	6.90	......	....do.
3445	....	....do	......do	....do	5.10	6.90	......	....do.
3446	....	....do	......do	....do	5.25	......	......	....do.
3743	....	Long Coteau River, Dak.	Sept. 9, 1873	....do	......	......	......	....do.

PASSERCULUS SAVANNA, (*Wils.*) *Bp.*

SAVANNA SPARROW.

Breeds in profusion throughout the region explored. Though not exclusively a bird of the prairie, it seems to be as much at home in the open plains as anywhere, associating intimately with *Centronyx* and the two leading species of *Plectrophanes*. It is also found, however, in the brush along the streams and larger rivers, which are unfrequented by the species just named, in company with the *Melospizæ* and *Juncones*. A large *suite* of specimens was taken, a part of it, however, unintentionally, for it is not an easy matter to always distinguish between the Savanna Sparrow and Baird's Bunting at gunshot range; and when I have killed a bird, I generally make a point of preserving it, even though it is not particularly wanted as a specimen, in order that its life may not have been taken in vain. The nest is placed on the ground, simply built of dried grasses, with a lining of horse-hair; the eggs are four or five in number, in this locality usually laid in the first half of June. Like nearly all the Fringilline birds of this region, the Savanna Sparrow is frequently the Cowbird's foster-parent, and in one instance that came under my observation the nest contained two of the alien eggs.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2792	....	Pembina, Dak	June 2, 1873	Elliott Coues	......	......	......	Skin.
2864	....	....do	June 5, 1873	....do	5.20	9.00	......	....do.
2865	....	....do	......do	....do	......	......	......	....do.
2883	....	....do	June 6, 1873	....do	......	......	......	....do.
2884	....	....do	......do	....do	......	......	......	....do.
3254	....	Near Pembina Mountains, Dak.	July 14, 2873	....do	......	......	......	....do.
3263	....	....do	......do	....do	......	......	......	....do.
3264	....	....do	......do	....do	......	......	......	....do.
3265	....	....do	......do	....do	......	......	......	....do.
3343	....	Turtle Mountain, Dak.	July 20, 1873	....do	......	......	......	....do.
3344	....	....do	......do	....do	......	......	......	....do.
3360	....	....do	July 25, 1873	....do	......	......	......	....do.
3382	....	....do	July 30, 1873	....do	......	......	......	....do.
3497	....	....do	Aug. 8, 1873	....do	......	......	......	....do.
3565	....	Mouse River, Dak	Aug. 23, 1873	....do	......	......	......	....do.
3597	....	....do	Aug. 30, 1873	....do	5.60	9.00	2.90	....do.
3707	♂	....do	Sept. 2, 1873	....do	6.00	10.00	3.00	....do.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3708	♀	Mouse River, Dak	Sept. 2, 1873	Elliott Coues	5.40	9.00	2.65	Skin.
3734		Long Coteau River, Dak.	Sept. 8, 1873	do				do.
3831		Mouse River, Dak	Sept. 27, 1873	do				do.
4262		Crossing of Milk River, Dak.	July 24, 1874	do				do.
4263		do	do	do				do.
4292		do	July 25, 1874	do				do.
4401		West of Sweetgrass Hills, Mont.	Aug. 11, 1874	do				do.
4402		do	do	do				do.
4445		Headwaters Milk River, Mont.	Aug. 14, 1874	do				do.
4463		do	Aug. 15, 1874	do				do.
4476		Rocky Mountains, latitude 49°.	Aug. 16, 1874	do				do.
4616		do	Aug. 26, 1874	J. H. Batty				do.
4617		do	do	do				do.

POŒCETES GRAMINEUS, (*Gm.*) *Bd.*

BAY-WINGED BUNTING, OR GRASS FINCH.

Like the last, the present species extends over the whole region explored, and breeds in abundance, while the general remarks upon distribution made in the case of the Savanna Sparrow are equally applicable here. Several nests were found at Pembina, containing eggs, about the middle of June. One of them also held two *Molothrus* eggs. The nests were built in open ground, quite deeply sunken, so as to be flush with the surface, and more substantial than those of many ground-builders, the walls being an inch or more thick at the brim. The cavity is small and deep in comparison with the whole nest. The usual materials are grasses and weed-stalks, the coarser material outside, the finer fibres within and at the bottom. The eggs, of which I have not found more than four, measure about 0.80 by 0.55; they are grayish-white, heavily marked all over with spots, dashes, and blotches of reddish-brown, and sprinkling of fine dots of the same or darker brown. The female is a close setter, not leaving the nest until nearly trodden upon, and then fluttering off as if crippled, to distract attention from the nest to herself.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2866	♀	Pembina, Dak	June 5, 1873	Elliott Coues				Skin.
2959	♀	do	June 13, 1873	do				Skin, nest, and 4 eggs.
3045		do	June 19, 1873	do				Nest, with 3 eggs, and 2 of *Molothrus*.
3340		Turtle Mountain, Dak.	July 20, 1873	do				Skin.
3341		do	do	do				do.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3342	....	Turtle Mountain, Dak.	July 20, 1873	Elliott Coues	......	......	......	Skin.
3349	....	....do	July 23, 1873	....do	......	......	......	....do.
3393	....	....do	Aug. 2, 1873	....do	......	......	......	....do.
3596	....	Mouse River	Aug. 30, 1873	....do	......	......	......	....do.
3730	....	Long Coteau River, Dak.	Sept. 8, 1873	....do	......	......	......	....do.
3731	....	....do	.....do	....do	......	......	......	....do.
4021	♂	Big Muddy River, Mont.	June 22, 1874	....do	......	......	......	....do.
4032	....	Quaking Ash River, Mont.	June 26, 1874	....do	......	......	......	....do.
4033	....	....do	.....do	....do	......	......	......	....do.
4261	....	Crossing of Milk River, Mont.	July 24, 1874	....do	......	......	......	....do.
4340	....	West of Sweetgrass Hills, Mont.	Aug. 8, 1874	....do	......	......	......	....do.
4448	....	Headwaters Milk River, Mont.	Aug. 14, 1874	J. H. Batty	......	......	......	....do.
4450	....	....do	.....do	....do	......	......	......	....do.
4465	....	....do	Aug. 15, 1874	....do	......	......	......	....do.
4497	....	Rocky Mountains, latitude 49°.	Aug. 16, 1874	....do	......	......	......	....do.
4514	....	....do	Aug. —, 1874	Elliott Coues	......	......	......	....do.
4618	....	....do	Aug. 26, 1874	....do	......	......	......	....do.
4619	....	....do	.....do	....do	......	......	......	....do.
4633	....	....do	Aug. 28, 1874	....do	......	......	......	....do.

SPIZELLA MONTICOLA, (*Gm.*) *Baird.*

TREE SPARROW.

No Tree Sparrows were observed in summer during either season, and I think none breed so far south as this. They appear in numbers with the general migration which brings the northern Fringillines, and which reaches this latitude about the 1st of October. Unlike several of the other species, however, they are not generally distributed, being confined to the woods, or rather the shrubbery along the streams, where they may be observed in small troops in company with the Snowbirds, and Harris's, Lincoln's, and White-crowned Sparrows. They are hardy birds, capable of enduring great cold, and I suppose that they may pass the winter in this latitude, as they certainly do a little distance southward in the Missouri region. I found them in considerable numbers at Fort Randall, Dak., during the winter of 1872–73, which they passed, to all appearances, very comfortably in the heavy undergrowth of the river-bottom.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3875	....	Mouse River, Dak.	Oct. 5, 1873	Elliott Coues	......	......	......	Skin.

SPIZELLA SOCIALIS, (*Wils.*) *Bp.*

CHIPPING SPARROW.

Specimens of this very common and familiar species were taken in the Rocky Mountains, and it was observed at other points where none were secured. It is not, however, a conspicuous feature of the avifauna of this region, most of which is not suited to its wants, and even at Pembina the Clay-colored Bunting takes the place which the "Chippy" fills in the East. It is, in fact, absent from the greater part of the country surveyed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4588	....	Rocky Mountains, lat. 49°.	Aug. 23, 1874	Elliott Coues.	......	......	......	Skin.
4598	....	....do	Aug. 24, 1874	......do	.....	......	......	.. do.
4599	....	....do	.....do	......do	......	......	......	...do.

SPIZELLA PALLIDA, (*Sw.*) *Bp.*

CLAY-COLORED BUNTING.

The Western Meadow Lark, Brewer's Blackbird, and the present species were the chief birds I observed at Pembina to indicate an avifauna in any wise different from that of the Eastern Province at large, and two of these cannot be considered very strong marks, since they both occur some distance further eastward. Upon my arrival, the 1st of June, these Buntings were all paired, the males were in full song, nidification was mostly finished, and the eggs were about to be laid. The first specimen procured, June 2, contained a fully formed egg. A nest taken June 5 was scarcely completed. The first complement of eggs was taken June 11; it numbered four. I think the eggs are mostly laid by the end of the second week in June. The nest is placed in bushes, generally within a few inches of the ground. It resembles that of the Chipbird, though it is not so neatly and artistically finished, and often lacks the horse-hair lining, which is so constant and conspicuous a feature of the latter. In size it averages about three inches across outside by two in depth, with a cavity two inches wide and one and a half inches deep. The structure is of fine grasses and slender weed-stalks, with or without some fine rootlets, sometimes lined with hair, like the Chippy's, sometimes with very fine grass-tops. It is placed in a crotch of the bush or in a tuft of weeds. The copses of scrubby willows I found to be favorite nesting-places, though any of the shrubbery along the river-bank seemed to answer. On those occasions when I approached a nest containing eggs, the female fluttered silently and furtively away, without venturing a protest. The eggs I found in one case to be deposited daily till the complement was filled. They measure 0.62 in length by 0.50 in breadth on an average. The ground-color is light dull green, sparsely but distinctly speckled with some rich and other darker shades of brown, these markings being chiefly confined to the larger end, or wreathed about it, though there are often a few specks here and there over the rest of the surface. From the earliness of the first sets of eggs, I suppose that two broods may be reared each season.

The Buntings were very numerous about Pembina, and during the breeding-season became conspicuous from the habit of the males at this season of mounting to the tops of the bushes and singing continually. The song is simple, but voluble and earnest, as if the birds gave the whole of their minds to it—as is doubtless the fact. It consists of three notes and a trill. The song ceases with the end of the breeding-season, when the birds retain nothing but their slight chirp. With its cessation, the characteristic breeding-habit of mounting the bushes is given up, and the birds become less conspicuous, though really more numerous than ever, from the accession of the new broods. They then go in little troops, which haunt all the shrubbery and mix intimately with the other Sparrows which frequent like situations. They are not, however, to be found on the prairie at any considerable distance from woods or shrubby undergrowth. As the season advanced, and during my progress westward, I found them in equal abundance on Pembina and Turtle Mountains and along the Mouse River.

The next season none were noticed in the Upper Missouri country. They cannot be so numerous in this region, for I could hardly have overlooked them altogether. Nevertheless, they extend across the country to the Rocky Mountains, as specimens were procured west of the Sweetgrass Hills.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2790	♀	Pembina, Dak	June 3, 1873	Elliott Coues				Skin; contained egg ready for extrusion.
2838		do	June 4, 1873	do	5.25	7.25		Skin.
2856	♂	do	June 5, 1873	do	5.00	7.60		do.
2857	♀	do	do	do	5.10	7.50		do.
2858	♂	do	do	do	5.30	7.60		do.
2867		do	do	do				Nest; parents Nos. 2857, 2858.
2879		do	June 6, 1873	do	5.40	7.70		Skin.
2880	♂	do	do	do	5.50	8.00		do.
2881	♂	do	do	do	5.40	7.70		do.
2882	♀	do	do	do	5.20	7.40		do.
2901	♂	do	June 7, 1873	do	5.25	7.75		do.
2902	♂	do	do	do	5.30	7.50		do.
2903	♀	do	do	do	5.20	7.60		do.
2904	♂	do	do	do	5.50	7.70		do.
2905	♂	do	do	do	5.20	7.40		do.
2906	♂	do	do	do	5.30	7.90		do.
2907	♂	do	do	do	5.50	7.70		do.
2908	♂	do	do	do	5.30	7.80		do.
2909	♂	do	do	do	5.50	7.90		do.
2930		do	June 11, 1873	do				Nest, with 4 eggs.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2956	♂	Pembina, Dak	June 11, 1873	Elliott Coues.	5. 10	7. 60		Skin.
2967	♂	do	June 13, 1873	do				do.
2979		do	June 14, 1873	do	5. 00	7. 50		do.
2986		do	do	do	5. 75			Skin; nest with 3 eggs
2987		do	do	do				Skin; nest with 4 eggs.
2985	♂	do	June 16, 1873	do	5. 25	7. 60		Skin.
3118		do	June 22, 1873	do				Egg.
3285		50 miles west Pembina Mountains.	July 15, 1873	do	5. 40	8. 00		Skin.
3298		do	July 16, 1873	do				do.
3338		Turtle Mt., Dak	July 20, 1873	do				do.
3339		do	do	do				do.
3346		do	July 23, 1873	do				do.
3347		do	do	do				do.
3348		do	do	do				do.
3388		Mouse River, Dak	July 30, 1873	do				do.
3389		do	do	do				do.
3394		do	Aug. 2, 1873	do				do.
3416		Turtle Mt., Dak	Aug. 8, 1873	do				do.
3480		Mouse River, Dak	Aug. 13, 1873	do	4. 66	8. 60		do.
3598		do	Aug. 30, 1873	do				do.
3735		Long Coteau River, Dak.	Sept. 8, 1873	do	5. 95	7. 50	2. 30	do.
3804		Mouse River, Dak	Sept. 22, 1873	do	5. 60	7. 75	2. 40	do.
3805		do	do	do	5. 90	8. 10	2. 50	do.
4389		West of Sweetgrass Hills.	Aug. 8, 1874	do				do.
4373		do	Aug. 9, 1874	do	5. 35	8. 50	2. 60	do.

JUNCO HYEMALIS, (*Linn.*) *Scl.*

EASTERN SNOWBIRD.

The Snowbird appeared along the Mouse River about the middle of September in troops, as usual, and at once became abundant. I had expected to find it breeding on Pembina and Turtle Mountains, and still judge it likely that it does so, though it did not come under my observation. It may not be generally known that in the Eastern States it breeds as far south as Virginia and the Carolinas, if not still farther. While on the South Virginian Alleghanies, in the summer of 1875, at an altitude of about 5,000 feet, I scared a female off her nest, which contained four eggs. This southerly breeding-range in the mountains explains the sudden appearance of the birds upon the first cold snap in October. While in the Rocky Mountains, in August, 1874, I expected to find either this species or *J. oregonus*, but none appeared in the vicinity of our camp. The Mouse River specimens seem to be pure *hyemalis*, though the *Zonotrichia* of this same locality is *Z. intermedia*, not *Z. leucophrys*.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3767		Mouse River, Dak	Sept. 16, 1873	Elliott Coues.				Skin.
3876	♂	do	Oct. 5, 1873	do				do.

ZONOTRICHIA QUERULA, (*Nutt.*) *Gamb.*

HARRIS'S FINCH.

A fine series of specimens of this handsome and interesting Finch was secured at our Mouse River Depôt during the latter half of September and beginning of October. Its breeding-grounds are as yet unknown; but these birds, at any rate, came from the north, and, as I was out every day with my gun about that time, the earliest date given below (September 18) probably indicates very nearly the time of their arrival. The previous year I had observed the birds at Fort Randall, Dakota, in October; but none remained through the winter in that locality. According to Prof. F. H. Snow, of Kansas, they winter in that State, and they have been observed by others in abundance during the migrations along the Lower Missouri, in Missouri and Iowa. I saw none at Pembina, where I suppose I arrived after they had passed on. The distribution of the species is very limited, and, as already observed, its breeding-range is not yet made out. My Mouse River specimens are, I think, the westernmost hitherto recorded. These were all in fall plumage, apparently of the first year, though a portion of the White-crowned Sparrows that came with them had perfect head-markings. They came very quietly from the north, and all at once thronged the bushes and shrubbery along the banks of the stream, in company with several other brush-loving Fringillines. At this period, they were songless, and had no note excepting a weak chirp. When disturbed at their avocations, they have a habit of flying up to the tops of the bushes to see what the fuss is about, and in this conspicuous position they may of course be readily destroyed. Their general habits appear to be much the same as those of the other *Zonotrichiæ*, though their large size, reddishness, and heavy dark markings underneath make them look somewhat like Fox Sparrows.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3770	♂	Mouse River, Dak ..	Sept. 18, 1873	Elliott Coues.	7.75	11.25	3.50	Skin.
3771	♂	....do	.......do	....do	7.50	11.10	3.40	...do.
3779	♂	....do	.......do	....do	7.25	10.85	3.40	...do.
3788	....	....do	Sept. 19, 1873	....do	7.40	11.20	3.50	...do.
3806	...	....do	Sept. 22, 1873	....do	7.30	10.70	3.40	...do.
3807	....	....do	.......do	....do	......	10.20	3.00	...do.
3837	....	....do	Sept. 30, 1873	....do	7.50	11.25	3.40	...do.
3838	....	....do	.......do	....do	7.60	10.90	3.40	..do.
3871	♂	....do	Oct. 3, 1873	....do	7.80	11.25	3.40	...do.

ZONOTRICHIA LEUCOPHRYS INTERMEDIA, *Ridg.*

RIDGWAY'S SPARROW.

I was rather surprised to find that the White-crowned Sparrows of the Mouse River country were of this variety instead of typical *leuco-*

phrys, but such was the case, as shown beyond question by some of the specimens taken with perfect head-dress. In the Rocky Mountains, this variety was of course to be expected. In the latter region, specimens were procured in August, probably bred in the vicinity, as no migration had then begun; but in the rest of the country explored, no *Zonotrichiæ* were seen until the coming of the fall birds, when they became at once abundant in the shrubbery of the streams, about the middle of September.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3773	....	Mouse River, Dak ..	Sept. 18, 1873	Elliott Coues.	6.25	9.10	2.95	Skin.
3774	....	....do	......do	....do	6.60	9.60	3.00	...do.
3775	....	....do	......do	....do	6.75	10.00	3.10	...do.
3776	....	....do	......do	....do	6.70	9.90	3.05	...do.
3777	....	....do	......do	....do	6.75	10.00	3.05	...do.
3778	....	....do	......do	....do	7.00	10.20	3.20	...do.
3792	....	....do	Sept. 19, 1873	....do	6.50	9.50	2.90	...do.
3793	....	....do	......do	....do	6.30	9.10	2.80	...do.
3808	....	....do	Sept. 22, 1873	....do	6.50	9.70	3.10	...do.
3809	....	....do	......do	....do	6.85	10.00	3.10	...do.
3810	....	....do	......do	....do	6.65	9.65	3.00	...do.
3811	....	....do	......do	....do	......	......	......	.. do.
3812	....	....do	......do	....do	7.00	10.00	3.10	...do.
3830	....	....do	Sept. 30, 1873	....do	6.75	9.75	3.15	...do.
4533	....	Rocky Mountains, latitude 49°.	Aug. 20, 1874	....do	......	......	......	...do.
4564	....	....do	Aug. 22, 1874	....do	......	......	......	...do.

MELOSPIZA LINCOLNI, (*Aud.*) *Bd.*

LINCOLN'S FINCH.

Observed in large numbers during the latter part of September and beginning of October, along the Mouse River. It arrived from the north at the same time that the Snowbirds and *Zonotrichiæ* did, and during the summer was only observed in the Rocky Mountains late in August. It is a species of general distribution in North America, but it may be questioned whether it breeds anywhere in this latitude except in the Rocky Mountains. As observed along Mouse River, it was a shy and secretive bird, spending its time near the ground in the tangle along the river-bottom, and plunging into the thickest retreats upon slight alarm, with a low, rapid, jerky flight. The only note I heard was a slight chirp. Altogether its habits appear to most closely resemble those of the Swamp Sparrow, to which it is so nearly related in physical characters.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3763	....	Mouse River, Dak ..	Sept. 16, 1873	Elliott Coues.	5. 75	7. 80	2. 50	Skin.
3764	....	....do	......do	....do	5. 75	7. 75	2. 50	...do.
3784	....	....do	Sept. 18, 1873	....do	5. 75	7. 75	2. 40	...do.
3789	....	....do	Sept. 19, 1873	....do	5. 75	7. 90	2. 40	...do.
3813	....	....do	Sept. 22, 1873	....do	6. 00	8. 25	2. 50	...do.
3814	....	....do	......do	....do	6. 10	8. 20	2. 50	...do.
3815	....	....do	......do	....do	5. 80	7. 80	2. 40	...do.
3816	....	....do	......do	....do	5. 85	8. 30	2. 50	...do.
3874	....	....do	Oct. 5, 1873	....do	5. 50	8. 10	2. 50	...do.
4589	....	Rocky Mountains, latitude 49°.	Aug. 23, 1874	J. H. Batty...	......	......	......	...do.

MELOSPIZA PALUSTRIS, (*Wils.*) *Bd.*

SWAMP SPARROW.

This is another of the several species of the family which were observed during the autumnal movement at the camp on Mouse River, from the middle of September until I left the country, the second week in October. It haunts the closest and most impenetrable shrubbery, to which it clings with such pertinacity that it is liable to be overlooked unless diligently sought for. I have seldom seen it in plain view, and never, to my recollection, at any distance from the ground, or on the outskirts of the undergrowth. It has been commonly considered confined to the Eastern Province, and the specimens below enumerated are, with one exception, the westernmost hitherto recorded. Dr. H. C. Yarrow, however, found it in Southern Utah some four years ago. The difficulty of tracing it westward, where it seems to be less abundant than it is in the Atlantic districts, is probably one reason why its distribution was long supposed to be more restricted than it really is.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3762	....	Mouse River........	Sept. 16, 1873	Elliott Coues	......	......	......	Skin.
3790	....	....do	Sept. 19, 1873	....do	......	.....	......	...do.
3791	....	....do	......do	....do	......	......	......	...do.
3830	....	....do	Sept. 27, 1873	....do	5. 60	8. 10	2. 35	...do.
3867	....	....do	Oct. 1, 1873	....do	5. 90	8. 10	2. 50	.. do.
3873	♀	....do	Oct. 5, 1873	....do	5. 50	7. 70	2. 25	...do.

MELOSPIZA MELODIA, (*Wils.*) *Bd.*

SONG SPARROW.

By an oversight, I stated in the "Birds of the Northwest" that I did not find this species in Northern Dakota. A specimen, however, was procured at Turtle Mountain early in August. It appears to be rare in this part of the country, as this was the only one taken, and I find no record respecting it except in my register of specimens.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3305	....	Turtle Mount'n, Dak.	Aug. 2, 1873	Elliott Coues	......	......	......	Skin.

CALAMOSPIZA BICOLOR, (*Towns.*) *Bp.*

LARK BUNTING.

The apparent absence of this species from the Red River region, with its abundance on the Missouri, is one of the strong marks of difference in the fauna of the two watersheds. It is an abundant and characteristic species of the sage-brush country of the Upper Missouri, and extends thence to the Rocky Mountains through the Milk River region. Specimens were taken soon after leaving Fort Buford, and others at various points to the headwaters of Milk River. The bird is rather a late breeder, unless the eggs found July 9 and 21 were those of a second brood, which is probable, since at no time did I hear the mating song of the males, or witness the singular aërial excursions which mark the same period of the bird's life, like those of the Yellow-breasted Chat. The earliest male specimens procured were already in worn and faded plumage. The eggs are four or five in number, measuring 0.80 to 0.95 in length by about 0.65 in breadth; they are pale bluish-green, like those of *Sialia*, and normally unmarked, though occasionally sparsely dotted. Two Cowbird eggs were found in one of the nests secured. The nest is sunken in the ground, so that the brim is flush with the surface, and is built of grasses and weed-stalks, lined with similar but finer material.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4034	....	Quaking Ash River, Mont.	June 26, 1874	Elliott Coues	......	......	......	Skin.
4035	....	....do	......do	....do	......	......	......	...do.
4183	....	Near Frenchman's River, Mont.	July 9, 1874	....do	......	......	......	Nest with 2 eggs and of 2 *Molothrus.*
4186	....	....do	......do	....do	......	......	......	Skin.
4248	♂	Two Forks of Milk River.	July 18, 1874	....do	......	......	......	...do.
4250	....	Near Two Forks of Milk River.	July 21, 1874	....do	......	......	......	Set of 4 eggs.
4341	♂	West of Sweetgrass Hills, Mont.	Aug. 8, 1874	....do	......	......	......	Skin.
4342	♂	....do	......do	....do	......	......	......	...do.
4343	♂	....do	......do	....do	......	......	......	...do.
4344	♀	....do	......do	....do	......	......	......	...do.
4373	♂	....do	Aug. 9, 1874	....do	6.75	10.35	3.40	...do.

GONIAPHEA LUDOVICIANA, (*Linn.*) *Bowd.*

ROSE-BREASTED GROSBEAK.

I was pleased to find this truly elegant bird breeding in abundance at Pembina in the undergrowth of the heavy timber along the banks of the Red River, as I had never before enjoyed a good opportunity of studying its habits. It was not observed at any other point along the Line, though stated to penetrate as far northward as the Saskatchewan region. A fine *suite* of specimens was carefully preserved, and several sets of eggs procured. The birds were mating and in full song by the beginning of June, when I arrived upon the spot, but no nests were found until the 21st. Four was the largest number found in a nest; others contained only two or three, but in all incubation had begun. The only nest I took myself was built in a thick grove of saplings, about eight feet from the ground; it contained three eggs averaging an inch in length by three-fourths in breadth. These were of a pale dull green color, profusely speckled with reddish-brown. The nests were rather rude and bulky structures, about six inches across outside by four in depth, with the cavity only half as much each way, owing to the thickness of the loose walls. They were built entirely of the slender tortuous stems and rootlets of some climbing shrub, for the most part loosely interlaced, though more firmly, evenly, and circularly laid around the brim, and finished sometimes with a little horse-hair lining, sometimes without. The male at this season has a delightful song. The female is, however, nearly voiceless, and of extremely retiring disposition.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2794	♂	Pembina, Dak	June 2, 1873	Elliott Coues.	7.75	12.75	......	Skin.
2795	♂	do	do	do	7.75	12.75	......	do.
2796	♂	do	do	do	7.75	12.75	......	do.
2797	♀	do	do	do	8.10	13.00	......	do.
2798	♀	do	do	do	8.00	12.50	......	do.
2841	♂	do	June 4, 1873	do	8.00	13.00	......	do.
2842	♀	do	do	do	7.75	12.75	......	do.
2851	♂	do	June 5, 1873	do	8.10	12.75	......	do.
2852	♂	do	do	do	7.75	12.50	......	do.
2928	♂	do	June 9, 1873	do	7.80	12.00	......	do.
2929	♂	do	do	do	8.00	13.00	......	do.
2965	♀	do	June 13, 1873	do	7.90	12.90	......	do.
3085	....	do	June 21, 1873	do	......	......	......	Nest with 3 eggs.
3113	....	do	June 22, 1873	do	......	......	......	Two eggs.
3129	..	do	June 23, 1873	do	......	......	......	Nest with 4 eggs.
3170	♂	do	June 25, 1873	do	......	......	......	Skin.

PIPILO ERYTHROPHTHALMUS, (*Linn.*) *Vieill.*

TOWHEE BUNTING.

The *Pipilo* of the Red River Valley is clearly referable to true *erythrophthalmus*, though even in this locality, decidedly Eastern in the complexion of its avifauna, there is a slight tendency toward the characters of *maculatus* var. *arcticus*.

The bird was not uncommon about Pembina, where it was breeding in June. A nest was taken June 11, containing two eggs that belonged in it, together with *three* that did not, having been deposited by the Cowbirds.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2802	♂	Pembina, Dak	June 3, 1873	Elliott Coues	8. 25	11. 50	......	Skin.
2803	....	....do	..... do......	....do	......	......	......	....do.
2931	....	....do	June 11, 1873	....do	......	.....	......	Nest with 2 eggs, and 3 eggs of *Molothrus*.
2976	♀	....do	June 14, 1873	....do	7. 75	10. 75	......	

PIPILO MACULATUS ARCTICUS, (*Sw.*) *Coues*.

SPOTTED TOWHEE.

Along the parallel of 49°, this form becomes established at least as far east as the Mouse River, where I secured a specimen in September. Along the Missouri, *erythrophthalmus* prevails, according to Dr. Hayden, up to latitude 43°, beyond which it is replaced by the present. The Spotted Towhees were found to be abundant along the Upper Missouri, above Fort Buford, in the undergrowth of the river-bottoms; were not noticed along the tributaries of the Milk River, which are less suited to their wants, nor of course on the open prairie between the successive northern affluents. They were again met with, however, in the Rocky Mountains. It is also known to extend northward into the Saskatchewan country. Excepting its different call-note, which curiously resembles that of a Catbird, its habits and manners are the counterpart of those of the Eastern form.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3760	....	Mouse River, Dak...	Sept. 16, 1873	Elliott Coues	......	......	......	Skin.
4029	....	Quaking Ash River, Mont.	June 26, 1874	....do	......	......	......	...do.

DOLICHONYX ORYZIVORUS, (*Linn.*) *Sw.*

BOBOLINK.

At Pembina, in June, Bobolinks were breeding in large numbers on the open prairie adjoining the river. The ground near the river has a meadowy character, which seems to exactly suit them, and they were evidently perfectly at home. The gaily dressed males, in the pink of perfection as to their nuptial attire, and singing with the utmost volubility, were very conspicuous objects all over the prairie; but the secretive and homely females were seldom observed unless accidentally flushed from the grass. The nest is so well hidden that I did not discover one, though I searched long and carefully on more than one occasion; and I am therefore unable to state the exact period of laying. To judge from the actions of the birds and the complete separation and hiding of the females, incubation was in progress by the second week in June.

On the same parallel of latitude, I traced the species westward quite to the Rocky Mountains, where it was not uncommon in August about Chief Mountain Lake. In the Upper Missouri country, however, I failed to observe a single individual. The sterile, alkaline, and sage-brush nature of most of this region seems to be ill-suited to its wants.

The very highly plumaged specimens taken at Pembina have been made by Mr. R. Ridgway the basis of a var. *albinucha*, the buffy patch upon the back of the neck being nearly white in these cases.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2862	♂	Pembina, Dak	June 5, 1873	Elliott Coues	7.25	12.10	......	Skin.
2863	♂	....do	......do	....do	7.10	11.90	......	...do.
2885	♂	....do	......do	....do	......	......	......	...do.
2886	♀	....do	......do	....do	......	......	......	...do.
2988	♂	....do	June 14, 1873	....do	......	......	......	...do.
2989	♂	....do	......do	....do	......	......	......	...do.
2990	♂	....do	......do	....do	......	......	......	...do.
3236	♂	....do	July 8, 1873	....do	......	......	......	...do.
3288	♀	50 miles west of Pembina Mountains.	July 15, 1873	....do	6.90	11.00	......	...do.
3534	....	Mouse River, Dak...	Aug. 16, 1873	....do	......	......	......	...do.
4614	♂	Rocky Mountains, latitude 49°.	Aug. 26, 1874	J. H. Batty...	......	......	......	...do.
4615	♂	....do	......do	....do	......	......	......	...do.

MOLOTHRUS ATER, (*Bodd.*) *Gray*.

COWBIRD.

I have nowhere found the Cowbird more abundant than it is in summer throughout the region surveyed by the Commission. Even were the birds not seen, ample evidence of their presence in numbers would be found in the alien eggs with which a majority of the smaller birds of that country are pestered. Scarcely any species, from the little Flycatcher (*E. minimus*) and the Clay-colored Bunting up to the Towhee and Kingbird, escapes the infliction. The breeding species are there fewer than in many or most localities in the East, though abounding in individuals; both of which circumstances tend to increase the proportion of cases in which the parasitism is accomplished. It has been customary—and very properly so—to record the various species which suffer from the Cowbird; but it seems probable that when the whole truth is known very few of those that breed within the Cowbird's summer range will be found to be passed over—among those whose eggs are not considerably larger than its own, and whose nests are accessible to the vagrant.

Although, as I have said, the Cowbirds are distributed over the whole country, yet they focus in and about the settlements; and by the same token they seem to follow the travelling parties and camp with them. The same is the case in all other parts of the West where I have observed the bird. They are like the small wolves (coyotés) in this respect. Being rarely molested, they acquire a wonderful heedlessness, and ramble unconcernedly through the camp under the feet of the horses and mules, and almost under our own. In July and August particularly, when the year's young are first on wing, gathering in small troops, they appear to have no comprehension of danger whatever, and are occasionally punished with a crack from the "black-snake" of some facetious teamster,—and, unlike a mule, they are never of any use afterward. One was actually caught by hand as it fluttered about a man's head, apparently intending to alight upon what it may have supposed to be a peculiar mule. Some time in August the birds become less numerous, apparently moving off somewhere. There seems to be something not yet clearly understood in their movements at this season. How long they actually remain in the country I am unable to say.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2840	♂	Pembina, Dak	June 4, 1873	Elliott Coues	7.75	13.50		Skin.
2932		do	June 11, 1873	do				Three eggs in nest of *Pipilo*.
3046		do	June 19, 1873	do				Two eggs in nest of *Spizella pallida*.
3078	♂	do	June 20, 1873	do				Skin.
3079		do	do	do				do.
3080		do	do	do				do.
3087		do	June 21, 1873	do				Egg in nest of *Empidonax minimus*.
3106	♀	do	June 22, 1873	do				Skin.
3229	♂	do	July 7, 1873	do				do.
3230	♂	do	do	do				do.
3231	♂	do	do	do				do.
3237	♂	do	July 8, 1873	do				do.
3238	♂	do	do	do				do.
3239	♂	do	do	do				do.
3307		75 miles west of Pembina Mountains.	July 17, 1873	do				do.
3452		Mouse River, Dak.	Aug. 9, 1873	do				do.
3554		do	Aug. 22, 1873	do				do.
3555		do	do	do				do.
3556		do	do	do				do.
3557		do	do	do				do.
4184		Near Frenchman's River, Mont.	July 9, 1874	do				Two eggs from nest of *Calamospiza*.
4185 *bis*		do	do	do				One egg from nest of *Tyrannus carolinensis*.

AGELÆUS PHŒNICEUS, (*Linn.*) *Vieill.*

RED-WINGED BLACKBIRD.

Although inhabiting the country at large, at least as far northwest as the region of the Saskatchewan, the Marsh Blackbird is necessarily somewhat localized in the details of its distribution, owing to the requirements of its economy. It is certainly not a conspicuous feature of the region surveyed, the greater portion of which is unsuited to its wants. Even at Pembina it was not the leading Blackbird, being outnumbered both by the Yellowheads and Brewer's. I find in my notebooks no record of observation respecting it except in this locality, but this may have been my fault of neglecting to note the occurrence of so common a species at other points.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
3052	♂	Pembina, Dak	June 19, 1873	Elliott Coues.				Skin.
3053	♀	...do	.....do	....do				....do.

XANTHOCEPHALUS ICTEROCEPHALUS, (*Bp.*) *Bd.*

YELLOW-HEADED BLACKBIRD.

In the breeding-season, the Yellow-headed Blackbird gathers in colonies on some marshy spot. I have observed it at this period in various portions of the West, from Northern Dakota to New Mexico, always noting its preference at this time for watery localities, however generally it may disperse over the country at other seasons. Its general distribution and migrations are given in my account of the species in the "American Naturalist" (v. 1871, p. 195) and "Birds of the Northwest" (p. 188). It is stated by Richardson to be abundant in the Fur Countries to about 58° north, reaching the Saskatchewan region by the 20th of May.

At Pembina it was breeding abundantly in the prairie sloughs, together with great numbers of Black Terns and a few Redwings. In one of the sloughs where I spent most of the day wading about, sometimes up to my waist and in some spots considerably deeper (as I was discouraged to find on getting into them), a large number of nests were found, mostly containing nestlings, but a few with eggs. This the last week of June. The nests were built much like those of the Long-billed Marsh Wren, as far as the situation goes, being fixed to a tuft of reeds or bunch of tall rank marsh-grass, some stems of which pass through the substance. They were placed at varying elevations, but always far enough above the water to be out of danger of inundation. The nest is a light, dry, rustling structure, swaying with the motion of the reed to which it is affixed, built of the same materials as those which support it, which are woven and plaited together; no mud is used, nor is there any special lining; the brim is thick and somewhat folded over, like the seam of a garment; but I never saw a nest, among the many examined, which was arched over, as stated by some authors. The diameter outside is 5 or 6 inches, and the depth nearly as much. From three to six eggs or young birds were found in different nests; the former measure from about an inch and an eighth in length by three-fourths in breadth. The ground-color is grayish-green; this is thickly spotted with different shades of reddish-brown, sometimes so profusely that the ground-color is obscured, especially at the larger end.

Since I stated, in the "Birds of the Northwest", that I had not then seen the species on the Missouri higher up than Leavenworth, I observed it above Buford during the season of 1874.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3005	♂	Pembina, Dak	June 17, 1873	Elliott Coues	10. 00	16. 25	......	Skin.
3006	♂	....do	....do	....do	10. 00	16. 30	......	....do.
3007	♀	...do	.....do	....do	8. 00	13. 65	......	....do.
3008	♂	....do	.....do	....do	10. 25	16. 75	......	....do.
3009	♂	....do	.....do	....do	......	......	......	....do.
3010	♂	....do	.....do	....do	......	......	......	... do.
3011	♂	....do	.....do	....do	......	......	......	....do.
3012	♂	....do	.....do	....do	......	......	......	....do.
3013	♂	....do	.....do	....do	......	......	......	....do.
3014	♂	....do	.....do	...do	......	......	......	....do.
3015	♂	....do	.....do	....do	......	......	......	....do.
3165	♀	....do	June 25, 1873	....do	......	......	......	....do.
3166	♀	....do	....do	....do	8. 25	13. 75	4. 60	....do.
3167	♀	....do	....do	....do	......	......	......	....do.
3168	♂	....do	....do	....do	......	......	......	....do.
3169	♂	....do	....do	....do	10. 50	16. 50	5. 60	....do.
3182	♂	...do	June 27, 1873	....do	......	......	......	....do.
3183	♂	...do	.....do	....do	......	......	......	....do.
3184	....	...do	.....do	....do	......	......	......	Skin (nestling).
3185	....	...do	.....do	....do	......	......	......	....do.
3396	....	Turtle Mountain, Dak.	Aug. 2, 1873	....do	......	......	......	Skin (young).
3491	♀	Mouse River, Dak...	Aug. 13, 1873	....do	8. 70	14. 10	......	Skin.
3550	♂	....do	Aug. 22, 1873	....do	10. 30	17. 00	......	....do.
3551	♂	....do	....do	....do	10. 75	17. 25	......	...do.

STURNELLA MAGNA NEGLECTA, *Aud.*

WESTERN MEADOW LARK.

All the Meadow Larks observed in this region, even at Pembina, where the fauna is so thoroughly Eastern, were typical *neglecta.* They are a common bird of the whole country, though perhaps less numerous as we approach the Rocky Mountains, in the very arid Milk River region. They are fond of good soil, and seemed to me to be scarcely so abundant, even in the Red River region, as I had observed them to be in more fertile portions of Southwestern Dakota, as the vicinity of Fort Randall, for example, and thence to Sioux City. They reach this part of the country early in April. Toward the end of June, in the region above

Fort Buford, several sets of eggs were procured, and at the same time young birds were already on wing.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2853	♀	Pembina, Dak	June 5, 1873	Elliott Coues	10.65	14.50	......	Skin.
3042	♀	....do	June 17, 1873	....do	......	......	......	...do.
3103	....	....do	June 21, 1873	....do	......	......	......	....do.
3213	♂	....do	June 30, 1873	....do	......	......	......	....do.
3336	....	Turtle Mountain, Dak.	July 20, 1873	....do	......	......	......	....do.
3402	....	....do	Aug. 2, 1873	....do	......	......	......	....do.
3403	....	....do	....do	....do	......	......	......	....do.
4023	....	Big Muddy River, Mont.	June 22, 1874	....do	......	......	......	....do.
4028	....	Quaking Ash River, Mont.	June 26, 1874	....do	......	......	......	Three eggs.
4079	....	Porcupine River, Mont.	June 28, 1874	....do	......	......	......	Five eggs.

ICTERUS SPURIUS, (*Linn.*) *Bp.*

ORCHARD ORIOLE.

One specimen, early in June, at Pembina, the only locality where observed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2897	♂	Pembina, Dak	June 6, 1873	Elliott Coues.	......	......	......	Skin.

ICTERUS BALTIMORE, (*Linn.*) *Daud.*

BALTIMORE ORIOLE.

Abundant at Pembina, the only locality where it was found. Like the Bobolinks of this region, the Orioles acquire an extremely brilliant plumage, in which the usual orange is often heightened into an intense flame-color. The same intensity of coloration has been noted by Mr. Allen in the cases of the Kansas Orioles. Several nests with eggs were taken during the latter part of the month of June.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2798	♂	Pembina, Dak	June 2, 1873	Elliott Coues	......	......	......	Skin.
2833	♂	....do	June 4, 1873	....do	7.90	12.30	......	....do.
2834	♂	....do	......do	....do	7.90	12.30	......	....do.
2940	♂	....do	June 11, 1873	....do	......	......	......	....do.
2941	♂	....do	......do	....do	......	......	......	....do.
2942	♂	....do	......do	....do	......	......	......	....do.
2961	♂	....do	June 14, 1873	....do	......	......	......	....do.
3121	....	....do	June 22, 1873	....do	......	......	......	Nest with 3 eggs.
3210	....	....do	June 28, 1873	....do	......	......	......	Nest with 4 eggs.
3334	♂	....do	July 8, 1873	....do	......	......	......	Skin.

SCOLECOPHAGUS CYANOCEPHALUS, (*Wagl.*) *Cab.*

BLUE-HEADED GRACKLE.

This is the characteristic Blackbird of the whole region in summer. Hundreds spend this season at Fort Pembina. It is no less abundant at Fort Buford, and in fact extends over the whole area. This is probably near its northern limit. Its general range includes the whole of the United States, from a little west of the Mississippi to the Pacific. It breeds indifferently throughout this area, but retires in winter from the northern portions of its habitat. In summer, it is the only representative of its genus in Dakota and Montana, but in the fall, after the migration, it is associated with *S. ferrugineus*. A nest containing three eggs was taken on the Quaking Ash River, Montana, June 26, 1874.

A full account of the habits of the species will be found in the "Birds of the Northwest", pp. 199–202.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2981	♂	Pembina, Dak	June 14, 1873	Elliott Coues	......	......	......	Skin.
2997	♂	do	June 16, 1873	do	9.75	16.50	5.70	do.
2998	♀	do	do	do	9.00	15.00	4.75	do.
3043	♂	do	June 18, 1873	do	......	......	......	do.
3055	♂	do	June 19, 1873	do	......	......	......	do.
3077	♂	do	June 20, 1873	do	......	......	......	do.
3107	♂	do	June 22, 1873	do	......	......	......	do.
3108	♂	do	do	do	......	......	......	do.
3109	♀	do	do	do	......	......	......	do.
3134	♂	do	June 24, 1873	do	......	......	......	do.
3135	♂	do	do	do	......	......	......	do.
3765	♂	Mouse River, Dak	Sept. 16, 1873	do	9.75	15.20	4.80	do.
3766	♀	do	do	do	9.50	14.85	4.60	do.
3795	♂	do	Sept. 19, 1873	do	10.10	16.00	5.15	do.
3796	♂	do	do	do	10.15	16.25	5.15	do.
3797	♂	do	do	do	10.25	16.30	5.25	do.
3798	♀	do	do	do	9.70	15.25	4.90	do.
3799	♀	do	do	do	9.00	14.50	4.50	do.
3800	♀	do	do	do	9.50	14.80	4.75	do.
3841	♂	do	Sept. 30, 1873	do	9.30	15.00	4.70	do.
3842	♀	do	do	do	9.00	13.75	4.25	do.
3843	♀	do	do	do	9.10	13.80	4.25	do.
3844	♀	do	do	do	9.00	13.65	4.20	do.
3845	♀	do	do	do	8.90	13.70	4.25	do.
3846	♀	do	do	do	9.10	14.00	4.35	do.
3847	♂	do	do	do	9.50	14.50	4.40	do.
3848	♂	do	do	do	9.60	14.75	4.60	do.
3872	♂	do	Oct. 3, 1873	do	9.50	14.70	4.60	do.
4027	....	Quaking Ash River, Mont.	June 26, 1874	do	......	......	......	Nest with 3 eggs.
4627	....	Rocky Mts., lat. 49°	Aug. 28, 1874	do	......	......	......	Skin.

NOTE.—The above list includes some specimens (from Mouse River) of *S. ferrugineus*, not now extricable without reference to the specimens themselves, the numbers having been confused; but the summer birds are all *cyanocephalus*.

SCOLECOPHAGUS FERRUGINEUS, (*Gm.*) *Sw.*

RUSTY GRACKLE.

The Rusty Grackle enters Dakota from the north in September, and then mixes indiscriminately with the preceding species; but the two will not be found together during the breeding-season. At our camp on the Mouse River, both species became very abundant after the second week in September, and so continued to be at the time of our departure, early in October. They associated together so intimately that a discharge into a flock of Blackbirds often brought down individuals of both species. Their habits are exactly the same, but the two species may be distinguished with little difficulty.

The foregoing tabular "List of specimens" includes, among those taken in September and October, several specimens of this species. The entry made in my register at the time did not discriminate between them, so that the numbers cannot be separated without handling the specimens, which are not conveniently accessible at time of writing.

QUISCALUS PURPUREUS ÆNEUS, *Ridg.*

BRONZED PURPLE GRACKLE.

Abundant at Pembina, where it was breeding in June in the hollows of trees. Occurred sparingly along the Mouse River in the fall, and during the last season traced westward to the Rocky Mountains. The specimens show the bronzy general coloration defined against the steel-blue head and neck, supposed to afford ground for the recognition of variety *æneus*.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2835	♂	Pembina, Dak	June 4, 1873	Elliott Coues.	12.25	......	......	Skin.
2911	♀	....do	June 7, 1873	....do	......	......	......	....do.
2915	♂	....do	June 9, 1873	....do	12.00	16.50	......	....do.
2916	♂	....do	......do	....do	......	......	......	....do.
3044	♂	....do	June 18, 1873	... do	......	......	......	....do.
3051	♂	....do	June 19, 1873	....do	......	......	......	....do.
3054	♂	....do	......do	....do	......	......	......	....do.
3112	....	....do	June 22, 1873	....do	......	......	......	Egg.
3669	♂	Mouse River, Dak ..	Oct. 3, 1873	....do	12.40	18.00	5.65	Skin.
4101	♂	Near mouth Milk River, Mont.	June 30, 1874	....do	......	......	......	....do.
4626	....	Rocky Mountains, latitude 49°.	Aug. 28, 1874	....do	......	......	......	....do.

CORVUS AMERICANUS, *Aud.*

COMMON CROW.

According to my observation, Crows are not very common in the region under consideration, though I saw a good many along the Mouse River. The species occurs, however, along the whole of the Missouri River. A nest containing five eggs, with the female parent, was secured on the Quaking Ash River, June 26, 1874.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4026	♀	Quaking Ash River, Mont.	June 26, 1874	Elliott Coues.	......	......	......	Skin, nest, 5 eggs.

CORVUS CORAX, *Linn.*

RAVEN.

Occasionally observed, but no specimens were secured.

PICA MELANOLEUCA HUDSONICA, (*Sab.*) *Coues.*

AMERICAN MAGPIE.

No Magpies were seen in the Red River region, where, if occurring at all, I doubt their presence as far east as the river itself. During the second season, however, they were very frequently noticed at various points on the Upper Missouri and Milk Rivers, and thence to the Rocky Mountains. On the 1st of July, newly fledged birds were taken near the mouth of Milk River, and at the Sweetgrass Hills, during the first week in August, imperfectly plumaged individuals, a little over a foot long, were noticed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4123	....	Near mouth of Milk River, Mont.	July 1, 1874	Elliott Coues.	......	......	.....	Skin.
4124	....	....do	.....do	....do	......	......	......	...do.
4316	....	Sweetgrass Hills, Mont.	Aug. 6, 1874	J. H. Batty ..	14.50	23.50	7.40	...do.
4317	....	....do	.....do	....do	......	......	......	...do.
4318	....	....do	.....do	....do	......	......	......	...do.
4624	....	Rocky Mountains, latitude 49°.	Aug. 22, 1874	Elliott Coues.	......	......	......	...do.

CYANURUS CRISTATUS, (*Linn.*) *Sw.*

BLUE JAY.

Not seen west of Pembina, where it was very abundant.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2787	♀	Pembina, Dak	June 2, 1873	Elliott Coues.	......	......	......	Skin.
2788	♂	....do	.....do	....do	......	......	......	...do.
2789	....	....do	.....do	....do	......	......	......	...do.

PERISOREUS CANADENSIS CAPITALIS, *Bd.*

ROCKY MOUNTAIN JAY.

Only seen in the Rocky Mountains at latitude 49°, where, however, it was common and doubtless bred. The specimens secured in this locality show the restricted dark areas of the head, upon which the variety *capitalis* is based.

There is no doubt, however, that the true *P. canadensis* occurs in suitable localities in other parts of the region surveyed, since it has been ascertained by Mr. T. M. Trippe to breed in the tamarack swamps of Minnesota.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4607	♂	Rocky Mountains, latitude 49°.	Aug. 25, 1874	Elliott Coues	12.00	17.00	5.80	Skin.
4608	♂	...do	.....do	....do	11.85	17.00	5.90	...do.
4609	♀	....do	.....do	....do	11.80	17.00	5.85	...do.

TYRANNUS CAROLINENSIS, (*Gm.*) *Temm.*

KINGBIRD.

Extremely numerous at Pembina, where many nests were taken after the middle of June, and traced westward as far as the Survey progressed that year. One of the nests (No. 3062) was placed on a rail fence, in the crotch formed by a post. In the Missouri region, it was equally abundant from Fort Buford to near the headwaters of the Milk River. Many nests containing two to four eggs were taken the latter part of June and early in July. One of these was particularly interesting, showing that the Summer Warbler is not the only species that gets rid of the obnoxious eggs of the Cowbird by building a second story to the nest, and thus leaving the alien egg to addle in the basement below. A nest taken near Frenchman's River, containing two eggs, seemed to be a curiously built affair, and on examining it closely I found the wrong egg embedded in its substance below the others (No. 4185). The Kingbird is not so much attached to woodland as has been supposed. I saw great numbers whilst travelling by rail, on the prairies of Minnesota and Dakota, where it seemed to be as much at home as anywhere. All things considered, it may be rated as one of the most abundant and generally diffused species of the whole region under consideration.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2799	♂	Pembina, Dak	June 2, 1873	Elliott Coues	......	......	......	Skin.
2831	♂	....do	June 4, 1873	....do	8.90	16.50	......	...do.
2832	♀	....do	.....do	....do	8.75	16.00	......	...do.
2977	....	....do	June 14, 1873	....do	8.00	14.00	......	...do.
3062	....	....do	June 19, 1873	....do	......	......	......	Nest with 4 eggs.
3081	....	....do	June 21, 1873	....do	......	......	......	Nest with 3 eggs.
3082	....	....do	.....do	....do	......	......	......	...do.
3083	....	....do	.....do	....do	......	......	......	...do.
3105	....	....do	June 22, 1873	....do	......	......	......	Skin.
3110	....	....do	.....do	....do	......	......	......	Nest with 4 eggs.
3120	....	....do	.....do	....do	......	......	......	...do.
3122	....	....do	.....do	....do	......	......	......	Nest with 3 eggs.
3125	....	....do	.....do	....do	......	......	......	Nest with 4 eggs.
3127	...	....do	June 23, 1873	....do	......	......	......	Two eggs.
3174	....	....do	June 26, 1873	....do	......	......	......	Nest with 2 eggs.
3211	....	... do	June 28, 1873	....do	......	......	......	Nest with 4 eggs.
4020	....	Big Muddy River, Mont.	June 22, 1874	....do	......	......	......	Skin; nest with 3 eggs.
4080	....	Porcupine River, Mont.	June 28, 1874	....do	......	......	......	Nest with 4 eggs.
4185	....	Near Frenchman's River, Mont.	July 9, 1874	....do	......	......	......	Nest with 2 eggs, and 1 of *Molothrus* excluded in the basement.

TYRANNUS VERTICALIS, *Say*.

ARKANSAS FLYCATCHER.

In the Red River region, *T. carolinensis* alone represents the genus; but throughout the Upper Missouri and Milk River country the two are found together, and it is hard to say which is the most numerous. They have much the same general habits, and often associate intimately together; indeed, I have known one tree to contain nests of both species. The cries of the *verticalis* are louder and harsher, with less of a sibilant quality, than those of the Kingbird; but there is little else to note as different. The nests of the *verticalis* are bulky and conspicuous, all the more easily found because the bird has a way of leaving the general woods of the river-bottom to go up the ravines that make down from the hillsides, and there nest on some isolated tree, miles away, perhaps, from any other landmark. Taking nests of both species at the same time, I found that those of *verticalis* were generally distinguishable by their larger size and softer make, with less fibrous and more fluffy material; but the eggs, if mixed together, could not be separated with any certainty. The sets of eggs taken during the latter part of June consisted of from three to six. Eggs were found as late as the second week in July. The nests were placed in trees at a height of from five or six to forty or fifty feet, generally in the crotch of a horizontal limb, at some distance from the main trunk; but in one case a nest was placed in the crotch which the first large bough made with the trunk. In one case, a pair of the Flycatchers built in the same tree that contained the nest of Swainson's Buzzard, and both kinds of birds were incubating at peace with each other, if not with all the world, when I came along to disturb them. In another one, they nested with a pair of Kingbirds. The birds display admirable courage in defense of their homes, loosing in their anxiety all sense of danger to themselves.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4011	...	Big Muddy River, Mont.	June 21, 1874	Elliott Coues.	......	......	......	Skin; nest with 3 eggs.
4012	...	....do	.....do	....do	......	......	......	Skin; nest with 5 eggs.
4017	♂	...do	June 22, 1874	....do	......	......	......	Skin, with set of eggs.
4018	♀	....do	.....do	....do	......	......	......	....do.
4019	♀	.. do	.....do	....do	......	......	......	....do.
4081	♀	Porcupine Creek, Mont.	June 28, 1874	....do	......	......	......	Skin; nest with 5 eggs.
4082	♂	...do	.....do	....do	......	......	......	Skin.
4083	♀	....do	.....do	....do	......	......	......	....do.
4084	♀	do	.....do	....do	......	......	......	....do.
4102	♂	Near mouth of Milk River, Mont.	June 30, 1874	....do	......	......	......	....do.
4103	...	....do	.....do	....do	......	......	......	....do.

SAYORNIS SAYUS, (*Bp.*) *Bd.*

SAY'S FLYCATCHER.

Not observed in the Red River region. First noticed at Fort Buford, where it used to perch upon the roofs of the houses, like the Pewit of the East, and traced thence westward to the Rocky Mountains. It occurred at intervals without being particularly numerous at any point. Its nidification was not observed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4329	♀	Sweetgrass Hills, Mont.	Aug. 6, 1874	J. H. Batty...	7.50	12.10	3.90	Skin.
4371	....	....do	Aug. 9, 1874	....do	7.75	13.40	4.40	....do.
4456	....	Headwaters Milk River, Mont.	Aug. 15, 1874	Elliott Coues.	7.75	12.50	4.10	....do.
4699	♂	Near Fort Benton, Mont.	Sept. 8, 1874	....do	......	......	......	....do.

CONTOPUS VIRENS, (*Linn.*) *Cab.*

WOOD PEWEE.

Only noticed at Pembina, which is probably at or near its northwestern limit.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2291	♂	Pembina, Dak	June 6, 1873	Elliott Coues.	6.25	10.25	......	Skin.

EMPIDONAX TRAILLI, (*Aud.*) *Bd.*

TRAILL'S FLYCATCHER.

I found this species common at Pembina, like the *minimus*, during the first week in June, but did not observe it later than the 9th of that month. They appeared to pass on northward, yet I can hardly suppose that the species never breeds here, which is fully as far north as the localities in which it nests in the Eastern States. However, if it does so, I overlooked the fact.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2782	♀	Pembina, Dak	June 2, 1873	Elliott Coues.	5.50	8.75	......	Skin.
2816	♂	....do	June 3, 1873	....do	6.00	9.10	......	....do.
2817	♂	....do	.....do	....do	6.25	9.60	......	....do.
2818	.....	....do	.....do	....do	6.00	9.00	......	....do.
2921	♀	....do	June 9, 1873	....do	5.50	8.40	......	....do.

EMPIDONAX MINIMUS, *Bd.*

LEAST FLYCATCHER.

Very abundant at Pembina, and found also on Turtle Mountain, beyond which not seen. I found it common on my arrival, the 1st of June, and during that month secured a large series of specimens, including many nests and eggs, the latter not until the middle of the month. The usual site of the nest is the upright crotch formed by three or more diverging twigs of some sapling or stout bush, usually 10 or 12 feet from the ground. One nest that I took I could reach standing on the ground, but another was in a slender elm-tree some 40 feet high, on a swaying bough, but in a crotch of upright twigs as usual. The female, during incubation, is as close a setter as some of the ground Sparrows. In one instance I came within arm's length before the bird flew, and then she merely fluttered out of reach and stood uttering a disconsolate note. The nest is usually let deeply down into the crotch, and bears the impress of the twigs. It is composed of intertwined strips of fine fibrous inner bark and decomposed weedy substances, matted with a great quantity of soft plant-down, and finished with a lining of a few horse-hairs or fine grasses, making a firm, warm fabric, with a smooth, even brim, about 2½ inches across outside and less than 2 inches deep; general shape tends somewhat to be conical, but much depends upon the site of the nest. The walls are thin, sometimes barely coherent along the track of the supporting twigs. The cavity is large for the size of the nest, scarcely or not contracted at the top, and about as wide as deep. In six instances I found not more than 4 eggs, which seems to be the full complement. These are pure white in color, of ordinary shape (but variable in this respect), and measure about two-thirds of an inch in length by one-half in breadth. Extremes of length noted were 0.59 and 0.68; the diameter is less variable.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2780	♂	Pembina, Dak.	June 2, 1873	Elliott Coues.	5.25	8.25	......	Skin.
2781	♂	....do	.....do	....do	5.40	8.30	......	....do.
2815	♂	....do	June 3, 1873	....do	5.50	8.25	......	....do.
2854	♂	....do	June 5, 1873	....do	5.25	8.25	......	....do.
2855	....	....do	.....do	....do	5.00	7.90	......	....do.
2887	♀	....do	June 6, 1873	....do	5.00	7.70	......	....do.
2888	♂	....do	.....do	....do	5.20	8.20	......	....do.
2922	♀	....do	June 9, 1873	....do	4.80	7.40	......	....do.
2938	♀	....do	June 11, 1873	....do	4.90	7.80	......	....do.
2939	♀	....do	.....do	....do	4.90	7.80	......	....do.
2956	♂	....do	June 12, 1873	....do	5.50	7.60	......	....do.
2957	♂	....do	.....do	....do	5.50	7.60	......	....do.
2960	....	....do	June 13, 1873	....do	......	......	......	Nest with 4 eggs.
2961	....	....do	.....do	....do	......	......	......	Nest with 2 eggs.
2980	♀	....do	June 14, 1873	....do	4.80	7.40	......	Skin.
3086	....	....do	June 21, 1873	....do	......	......	......	Nest with 4 eggs, and 1 of *Molothrus*.
3123	....	....do	June 22, 1873	....do	......	......	......	Nest with 3 eggs.
3124	....	....do	.....do	....do	......	......	......	Nest with 4 eggs.
3133	....	....do	June 24, 1873	....do	......	......	......	....do.
3415	....	Turtle Mountain, Dak	Aug. 8, 1873	....do	5.40	8.40	......	Skin.

EMPIDONAX HAMMONDI, *Bd.*

HAMMOND'S FLYCATCHER.

This species, which appears to be the Western representative of *minimus*, was only found in the Rocky Mountains, where a single specimen was secured in August.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
4537	....	Rocky Mountains, latitude 49°.	Aug. 20, 1874	Elliott Coues.	......	......	......	

EMPIDONAX OBSCURUS, *Bd.*

WRIGHT'S FLYCATCHER.

Instead of *trailli* var. *pusillus*, which I expected to find in the Rocky Mountains, this species was taken in that locality. The occurrence so far beyond its hitherto-known range is particularly interesting. Three specimens were taken during the latter part of August. The bird doubtless breeds in this region, which is the northernmost point by far at which it has been observed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
4520	....	Rocky Mountains, latitude 49°.	Aug. 19, 1874	Elliott Coues.	......	......	......	Skin.
4521	....	....do	.... do	....do	......	......	......	....do.
4532	....	....do	Aug. 20, 1874	....do	......	......	......	....do.

ANTROSTOMUS VOCIFERUS, (*Wils.*) *Bp.*

WHIPPOORWILL.

Although I took no specimens of this bird, its unmistakable notes were heard every night in June at Pembina, assuring me of its presence in numbers in the heavy timber of the river-botton. This locality is very near its northern limit, and it probably is not found any distance west of the Red River.

CHORDILES VIRGINIANUS, (*Briss.*) *Bp.*

NIGHT-HAWK; BULL-BAT.

Occurs in summer throughout the whole region surveyed, and is in most places very common. The birds of the arid Missouri region are referable, I suppose, to var. *henryi*. Eggs were found at Pembina June 13, and at the mouth of Milk River on the 1st of July; in both instances two in number, laid on the bare ground. So late as the 23d of July, newly hatched young were found at one of our camps on Turtle Mountain. Notwithstanding that they lay in the midst of a populous camp, where the men and animals constantly passed the spot, the female continued to brood them with courage and patience, and on too near approach would feign a broken wing, and tumble about in a manner that would have seemed ridiculous could her tender object have been forgotten. The male bird made a great ado, dashing down from overhead, but apparently without any clear idea of what was expected of him, or how to do it. Upon one of my visits to the spot I found that the young had been transported since I had been there last, though only to a distance of two or three yards.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2962	♀	Pembina, Dak	June 13, 1873	Elliott Coues	9.25	23.00	......	Skin and 2 eggs.
2982	♂	....do	June 14, 1873	...do	9.00	22.00	......	Skin.
2996	♂	....do	June 16, 1873	...do	9.75	23.50	8.10	...do.
3299	....	50 miles west of Pembina Mts.	July 16, 1873	....do	......	......	......	...do.
3300	....	....do	.....do	...do	......	......	......	...do.
3301	....	...do	.....do	...do	......	......	......	...do.
3351	....	Turtle Mt., Dak.....	July 23, 1873	....do	......	......	......	Skin (with nestling).
3477	....	Mouse River, Dak...	Aug. 10, 1873	...do	......	......	......	Skin.
3719	♀	...do	Sept. 3, 1873	...do	......	......	......	...do.
4117	....	Near mouth of Milk River, Mont.	July 1, 1874	....do	......	......	......	Two eggs.
4264	♂	Crossing of Milk River, Mont.	July 24, 1874	...do	......	......	......	Skin.
4265	♀	....do	.....do	...do	......	......	......	...do.
4301	♂	....do	July 25, 1874	....do	......	......	......	...do.

CHÆTURA PELAGICA, (*Linn.*) *Bd.*

CHIMNEY SWIFT.

Common at Pembina, and traced thence westward only to the Mouse River. Not seen in the Missouri region nor in the Rocky Mountains. I did not notice where the birds were breeding; but from the circumstance of seeing them habitually flying about over the timber of the river-bottom, instead of at the fort, I judge that they here still retained their primitive custom of nesting in hollow trees.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2800	♂	Pembina, Dak	June 2, 1873	Elliott Coues	......	......	......	Skin.
3076	....	....do	June 20, 1873	....do	......	......	......	...do.
3136	....	....do	June 24, 1873	....do	......	......	......	.. do.
3589	....	Mouse River, Dak ..	Aug. 27, 1873	... do	......	......	......	...do.

TROCHILUS COLUBRIS, *Linn.*

RUBY-THROATED HUMMINGBIRD.

Quite common at Pembina, in the open flowery glades of the woods along the river. Not seen west of this point.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
2850	♂	Pembina, Dak	June 5, 1873	Elliott Coues.	......	......	......	Skin.

SELASPHORUS RUFUS, (*Gm.*) *Sw.*

RUFOUS HUMMINGBIRD.

Found in considerable numbers at our camp on Chief Mountain Lake, in open flowery spots amongst the windfalls, at an altitude of about 4,200 feet.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
4522	....	Rocky Mountains, latitude 49°.	Aug. 19, 1874	Elliott Coues.	......	......	......	Skin.
4523	....	....do	.....do	....do	......	......	......	...do.
4535	....	....do	Aug. 20, 1874	....do	......	......	......	...do.
4536	....	....do	.....do	....do	......	......	......	...do.

CERYLE ALCYON, *Boie.*

BELTED KINGFISHER.

Of general distribution along the waters of this region as elsewhere in North America. I saw it on the Red, Mouse, Milk, and Missouri Rivers, and some of the affluents of the two last, as well as on the headwaters of the Saskatchewan.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2917	♀	Pembina, Dak	June 9, 1873	Elliott Coues.	......	......	......	Skin.

COCCYGUS ERYTHROPHTHALMUS, (*Wils.*) *Bp.*

BLACK-BILLED CUCKOO.

Somewhat to my surprise, this Cuckoo was ascertained to breed in the Pembina Mountains. I had not previously observed it along the Red River, nor did I meet with *C. americanus* anywhere during the survey. The nest was discovered July 12, at which date it contained a single young one, scarcely able to fly, the older ones of the same brood having doubtless already made off. The nest was in what I suppose to be an unusual situation, namely, an oak scrub less than two feet from the ground, in a dense thicket on the mountain-side. A large basement of loosely interlaced twigs rested in a crotch of the bush, supporting the nest proper, which consisted of a flat matting of withered leaves and catkins of the poplar. After a chase and a headlong plunge into an uncomfortable brier-patch, I managed to catch the little fellow, who, encouraged by the constant exhortations of his anxious mother, was scrambling off in a very creditable style for one so young.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3240	....	Pembina Mountains, Dak.	July 12, 1873	Elliott Coues	......	......	......	Skin (nestling).

PICUS VILLOSUS, *Linn.*

HAIRY WOODPECKER.

Observed in heavy timber on Turtle Mountain. As a species of general dispersion in Eastern North America, it doubtless occurs in other wooded portions of the Red and Missouri region. Exactly at what point it is modified into var. *harrisi* may not have been ascertained; but the change probably does not take place much, if any, east of the Rocky Mountains. Pure *villosus* occurs on the Missouri at Fort Randall.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3452 bis	....	Turtle Mountain, Dak.	July 20, 1873	Elliott Coues	......	......	....	Skin.

PICUS VILLOSUS HARRISI, (*Aud.*) *Coues*.

HARRIS'S WOODPECKER.

Found only in the Rocky Mountains.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4597	♂	Rocky Mountains, latitude 49°.	Aug. 24, 1874	Elliott Coues	......	......	......	Skin.

SPHYRAPICUS VARIUS, (*Linn.*) *Bd.*

YELLOW-BELLIED WOODPECKER.

Plentiful at Pembina, where it was breeding with the Redheads in June, and again seen on the Mouse River; not observed further west, nor anywhere in the Missouri country,—though we are not to infer that it is actually absent from that region. In these high latitudes (and further north—for it goes to 61° at least), it is probably only a summer resident. It seems to be more decidedly migratory than most of our Woodpeckers, and penetrates in winter to Central America. This may be partly, at least, due to the peculiarity of its food, for it feeds largely upon living cambium, and may not be able to secure this to its taste when the sap ceases to flow.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2849	♂	Pembina, Dak	June 5, 1873	Elliott Coues.	......	......	......	Skin.
2892	♀	....do	June 6, 1873	....do	......	......	......	....do.
2946	♂	....do	June 11, 1873	....do	......	......	......	....do.
3171	♂	....do	June 25, 1873	....do	......	......	......	....do.
3235	♀	....do	July 8, 1873	....do	....	......	......	....do.
3757	....	Mouse River, Dak ..	Sept. 16, 1873	....do	......	......	......	....do.

MELANERPES ERYTHROCEPHALUS, (*Linn.*) *Sw.*

RED-HEADED WOODPECKER.

Common along the Red and Upper Missouri Rivers. It probably extends, in suitable places, to the Rocky Mountains, but was not noticed after leaving the vicinity of the Missouri, as there is not wood enough to attract it along the affluents of the Milk River on the parallel of 49°.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2918	♀	Pembina, Dak	June 9, 1873	Elliott Coues	......	......	......	Skin.
4085	....	Porcupine Creek, Mont.	June 28, 1874	....do	......	......	......	....do.

ASYNDESMUS TORQUATUS, (*Wils.*) *Coues.*

LEWIS'S WOODPECKER.

While we were encamped on one of the headwaters of the Saskatchewan, at the eastern base of the mountains, a Lewis's Woodpecker flew overhead, and was distinctly recognized both by Mr. Batty and myself. At our permanent camp on Chief Mountain Lake, we confidently expected to see the species again and secure specimens, but in this we were disappointed, for not a single one was encountered in our excursions in the vicinity.

COLAPTES AURATUS, (*Linn.*) *Sw.*

GOLDEN-WINGED WOODPECKER.

Flickers were common along the Red and Mouse Rivers, and were also observed at Pembina and Turtle Mountains, which is equivalent to saying that the species inhabits the wooded portions of the Red River watershed. All the specimens secured were pure *auratus*, without a touch of *mexicanus*, and the mixed race probably does not occur in this region. This is another evidence of the distinction, which I continually insist upon, between the watersheds of the two great rivers.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2896	....	Pembina, Dak	June 6, 1873	Elliott Coues	......	......	......	Skin.
2912	♂	....do	June 7, 1873	....do	......	......	......	....do.
3050	♂	....do	June 19, 1873	....do	......	......	......	....do.
3337	....	Turtle Mountain, Dak.	July 20, 1873	....do	......	......	......	....do.
3553	....	Mouse River, Dak ..	Aug. 22, 1873	....do	......	......	......	....do.
3720	♀	....do	Sept. 3, 1873	....do	......	......	......	....do.

COLAPTES "HYBRIDUS" *of Baird.*

All the *Colaptes* of the Upper Missouri, Yellowstone, and Milk River region appear to be of the hybrid race, in which there is every degree of departure from the characters of typical *auratus.* The change begins somewhere on the Middle Missouri, as low down, *I think*, as Fort Randall, and certainly as old Fort Pierre. It is a point of interest that this mongrel style overruns into the Saskatchewan region; for, of two specimens secured at the eastern base of the mountains, one had the red quills and ash throat of *mexicanus*, and the cheek-patch mixed with red, while the other was nearly pure *auratus.*

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4507	♂	Rocky Mountains, latitude 49°.	Aug. 17, 1874	Elliott Coues.	......	......	......	Skin: red quills and ash throat of *mexicanus*; occipital crescent and brown cap of *auratus*; cheek-patch mixed red and black.
4590	♀	....do	Aug. 23, 1874	....do	......	......	......	Nearly pure *auratus.*

BUBO VIRGINIANUS, (*Gm.*) *Bp.*

GREAT HORNED OWL.

A pair of these Owls were observed at Pembina early in June, and two unfledged young ones, evidently belonging to them, were found on a fallen log in the timber-belt along the river. The nest was not discovered, though supposed to be in the hollow of a blasted tree that stood near. The old birds flew about apparently not in the least incommoded by the daylight, but were too wary to be approached; and though I set a steel trap for them, upon the log where the young had been, they did not put their foot in it. The two young birds, one of which was much larger than the other, and therefore supposed to be a female, were brought alive to camp, and kept during the whole season. They made more agreeable and amusing pets than birds of prey generally prove to be, and the fun we had out of them repaid the trouble of carrying them about. They became perfectly tame, would take food out of my hands, or even alight on my shoulder; and, after a while, when they were full-grown and in good plumage, I used to release them and allow them to forage for themselves during the night. They generally returned of their own accord, but sometimes I had to send one of my men in search of them; in fact, the care of these Owls was the chief duty of a certain member of the party during September. They began to hoot when about four months old. One of them died soon after, from some unexplained cause; the other survived all the vicissitudes of camp-life, including a pistol-shot from a man who mistook the bird for a wild one, and was finally, after travelling seven or eight hundred miles, safely deposited in an aviary in Saint Paul.

SPEOTYTO CUNICULARIA HYPOGÆA, (*Bp.*) *Coues.*

BURROWING OWL.

First observed at a point on the Boundary Line a little east of Frenchman's River, not far from the mouth of Milk River, where a few individuals inhabited a small settlement of Prairie Dogs (*Cynomys ludovicianus*). This seems to be about the northern limit of the species, and it is nowhere so abundant in this region as in many places further south. It was met with a second time a little west of Frenchman's River, and for the third time, in somewhat greater numbers, on a piece of prairie near Sweetgrass Hills. There were no Prairie Dogs here or at the locality last mentioned, so far as I know, but the ground was riddled with the burrows of the Tawny Marmots (*Spermophilus richardsoni*), which seemed to suit the Owls just as well.

Several other species of this family certainly inhabit the region surveyed; but the two foregoing were the only ones actually observed. The circumstances of a Survey like the present are not the most favorable for observation of these nocturnal birds; for, when night comes, a man is generally too tired to care about anything but sleep, especially when the prospect is breakfast by candle-light and "pull out" at daylight to argue again with mules and miles.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4187	...	Near Frenchman's River.	July 9, 1874	Elliott Coues	......	......	......	Skin.
4314	....	Sweetgrass Hills, Mont.	Aug. 3, 1874	...do	......	......	......	....do.
4315	....	....do	.....do	....do	......	......	......	....do.

CIRCUS CYANEUS HUDSONICUS, (*Linn.*) *Schl.*

MARSH HARRIER.

Common throughout the region surveyed, and in the vicinity of the streams and wooded parts of the country the most abundant of all the Hawks, not even excepting Swainson's Buzzard. A nest was discovered at Pembina, June 3, on the ground in the midst of the wild-rose patch that generally reaches out from the timber to the prairie. The nest was about a foot in diameter and a fourth as much in depth, with very slight depression. It was composed of dried grasses, rather neatly disposed, resting upon a bed of rose-twigs. It contained five eggs, slightly incubated. These were of nearly equal size at both ends, and measured respectively 1.87 by 1.45, 1.86 by 1.45, 1.82 by 1.44, 1.80 by 1.45, 1.80 by 1.42. The color was dull white, with a faint greenish tinge, but without distinct markings of any kind, though much soiled mechanically. On approaching the spot where I had supposed, from observing the birds two or three times, that the nest was concealed, the female did not fly up till I was within a few feet of her, when she made off with all speed and great outcry, calling her mate. He soon appeared, and the pair circled for some time overhead, the male silent and at a very reasonable distance; the female, more impetuous or more anxious, came nearer, and constantly uttering a harsh note. At Turtle Mountain, in July, nearly a whole family, the young of which were newly on wing, was shot, the prudent male alone escaping. While encamped on Mouse River I had frequent opportunities of observing the birds fishing for frogs in the stagnant pools near the main stream.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2801		Pembina, Dak	June 3, 1873	Elliott Coues				Nest with 5 eggs.
2947	♀	...do	June 11, 1873	...do				Skin, with sternum.
3375	♀	Turtle Mt., Dak	July 28, 1873	...do				Skin.
3376	♀	...do	...do	...do				...do.
3377	♂	...do	...do	...do				...do.
3378	♀	...do	...do	...do				...do.
3482	..	Mouse River, Dak	Aug. 10, 1873	...do				...do.
3532	..	.. do	Aug. 16, 1873	...do				...do.
3536	♂	...do	Aug. 17, 1873	...do				...do.
3538	..	...do	Aug. 19, 1873	...do				...do.
3737	♂	Long Coteau River, Dak.	Sept. 8, 1873	...do	17.75	40.75	13.25	...do.
3786	♂	Mouse River, Dak	Sept. 18, 1873	...do	18.75	41.50	13.50	...do.
3787	♀	...do	...do	...do	20.50	46.50	14.60	...do.
3870	♂	...do	Oct. 3, 1873	...do	18.50	40.50	13.35	...do.
4338	♂	West of Sweetgrass Hills, Mont.	Aug. 8, 1874	...do				...do.
4389	♂	...do	Aug. 10, 1874	...do				...do.
4636	♀	Rocky Mts., lat. 49°.	Aug. 30, 1874	J. H. Batty				...do.
4637	....	...do	...do	...do				...do.

ACCIPITER FUSCUS, (*Gm.*) *Gray*.

SHARP-SHINNED HAWK.

This dashing and elegant little Hawk is probably less rare in the region surveyed than my observations would indicate. I only recognized it on one occasion, when a specimen was procured, as below indicated. The second North American species of this genus, *A. cooperi*, undoubtedly occurs in this country, though it was not noticed.

While at Pembina I was assured by Colonel Wheaton, U. S. A., of the occasional occurrence in that vicinity of the Swallow-tailed Kite, *Elanoides forficatus*. This officer seemed to know the bird perfectly well, and it is not a species about which there could easily be any mistake. Its presence here was not entirely unexpected, since it had been already found by Mr. Trippe in Minnesota at lat. 47°, and a degree or two of latitude is of course nothing to a bird of such powers of flight as this Kite possesses.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3718	♀	Mouse River, Dak..	Sept. 3, 1873	Elliott Coues	12.50	25.50	8.00	Skin.

FALCO MEXICANUS POLYAGRUS, (*Cass.*) *Coues.*

AMERICAN LANIER FALCON.

At one of the astronomical stations on the west branch of the "Two Forks" of Milk River, no less than four species of large Hawks had their nests within sight of each other and only a few hundred yards apart. These were Swainson's and the Ferrugineous Buzzards, the Common Falcon, and the present species. Speaking of some of these Hawks in an article I recently contributed to the "American Naturalist" (vol. viii, 1874, 596,) I incorrectly omitted the Lanier, and all of the remarks relating to one of the nests of the supposed *F. communis* (the first one there spoken of) apply to the present species, though my account of the other nest, found a few miles away, is entirely accurate and pertinent.

I am not aware that the Lanier had before been found so far northwest as this, nor had we any reliable accounts of its nidification. In the "Birds of the Northwest" I gave a description of the eggs from a set procured by Dr. F. V. Hayden in the Wind River Mountains. The nest to which I now refer was discovered July 18, 1874, on the perpendicular face of the "cut-bank" of the stream. It contained three young, scarcely able to fly. Two of these were shot on the wing close by the nest; the third was subsequently brought to me alive by a soldier. The mother was shot, and, as well as I could determine, fell in a recess of the ground by the nest, in such a position that it could not be recovered. The male was not seen, or at any rate not recognized. This nest was built behind an upright column of earth, partly washed away from the main embankment, in such position that no full view of it could be obtained from any accessible standpoint. But it was certainly placed directly upon the ground, in a little water-worn hollow of the bank, behind the projecting mound, so that it was almost like a burrow. The spot being inaccessible from below, I had a man lowered by a rope from the top of the bank, but during the descent so much loosened earth fell into the place that the nest was completely hidden, so that its structure was left undetermined, if, indeed, there was any special structure.

This manner of nesting on the ground, in the depressions or on the projections of the cut-banks, seems to be readily adopted in this treeless region by all the Hawks, which, under other circumstances, regularly build in trees.

I should not omit to add that a colony of Cliff Swallows had affixed their nests of mud to the same embankment, a few yards from the site of the Falcon's eyrie, and appeared to be undisturbed in the possession of their homes.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4239	....	Two Forks of Milk River, Mont.	July 18, 1874	Elliott Cones.	......	......	......	Skin (nestling).
4240	....	....do	....do	....do	......	......	......	......do.

FALCO COMMUNIS, *Gm.*

PEREGRINE FALCON; DUCK HAWK.

As already stated in the foregoing account of ***F. polyagrus***, the Peregrine was nesting in the same place and under precisely similar conditions. Another pair had a nest about ten miles away on the same stream. Here the earth bank was perpendicular, and lying flat upon the brink I could look directly into the nest, which rested on a slight shelf about 12 feet below. It contained three young, not yet fledged, July 19. On approaching the spot, while yet several hundred yards away, I observed both parents circling high in the air, venting their displeasure at the prospective invasion in loud, harsh cries. On reaching the spot, I saw that the male thought it prudent to have business elsewhere, but the more couragous mother bird, desperate with fear and anger, made repeated dashes within a few feet of my head, till I judged it just as well to destroy her, as I had designs upon the young. She fell hurtling with a broken wing at the foot of the cliff, 30 or 40 yards below. The eyrie was totally inaccessible from below, and, as I had no rope, it was equally so from above. I tried for a long time to lasso the young ones and draw them up with a piece of cord; but they had a way of freeing themselves just before the noose drew tight, and I was obliged to leave them.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4232	♀	Two Forks of Milk River, Mont.	July 17, 1874	Elliott Cones	......	......	......	Skin.

FALCO RICHARDSONI, *Ridgw.*

RICHARDSON'S MERLIN.

One specimen, the only individual of this species observed, was taken on the headwaters of the Mouse River, September 8, 1873. I had no difficulty in approaching and shooting it, as it sat on the lower limb of a small tree. The stomach contained the remains of a Sparrow.

Since the supposed similarity of the sexes of this bird proves not to hold good, one of the strongest points of distinction between it and *F. columbarius* disappears, and the probability is that it is not specifically separable from the latter.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3729	♀	Headwaters Mouse River, Dak.	Sept. 8, 1873	Elliott Coues.	12.75	26.75	8.50	Eyes dark brown; legs yellow; lores, eyelids, base of upper and most of under mandible yellowish-green; cere more yellow; rest of bill and claws blue-black.

FALCO SPARVERIUS, *Linn.*

SPARROW HAWK.

Very abundant throughout the region surveyed. The specimens taken on Turtle Mountain, August 8, 1873, had at that date nearly assumed their first complete plumage; they were all members of the same family, and had not quite given up their companionship.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3049	♂	Pembina, Dak	June 19, 1873	Elliott Coues	......	......	......	Skin.
3212	♂	....do	June 28, 1873	.. do	......	......	......	....do.
3224	♀	...do	July 5, 1873	....do	......	......	......	....do.
3418	....	Turtle Mountain, Dak	Aug. 8, 1873	....do	......	......	......	....do.
3419	....	...do	.....do	....do	......	......	......	.. do.
3420	....	.. do	.....do	....do	......	......	......	... do.
3535	♂	Mouse River, Dak	Aug. 16, 1873	....do	......	......	......	... do.
3537	♀	....do	Aug. 17, 1873	....do	......	......	......	....do.
3570	♂	....do	Aug. 24, 1873	....do	10.50	22.50	......	....do.
3571	♀	....do	.....do	....do	11.50	24.50	......	....do.
3592	♀	....do	Aug. 30, 1873	...do	10.50	23.00	7.50	....do.
3599	♂	....do	.....do	....do	11.00	23.50	7.50	....do.
4086	♀	Porcupine Creek, Mont.	June 28, 1874	....do	......	......	......	....do.
4104	♂	Near mouth Milk River, Mont.	June 30, 1874	....do	......	......	......	....do.
4105	♀	...do	.... do	....do	......	......	......	....do.
4513	♀	Rocky Mountains, latitude 49°.	Aug. 18, 1874	....do	......	......	......	....do.
4625	....	....do	Aug. 28, 1874	J. H. Batty	......	......	......	....do.

BUTEO BOREALIS, (*Gm.*) *Vieill.*

RED-TAILED BUZZARD; HEN HAWK.

I frequently observed this Hawk in different portions of Iowa, Kansas, Minnesota, and Dakota; but, in most portions of the last-named Territory, it is not nearly so abundant as the next species (*B. swainsoni*). The only individual noticed during my connection with the Survey was shot on the Mouse River, where *B. swainsoni* was the prevailing form.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3755	....	Mouse River........	Sept. 14, 1873	Elliott Coues	21.65	49.00	14.50	

BUTEO SWAINSONI, *Bp.*

SWAINSON'S BUZZARD.

Very abundant in Northern Dakota and Montana, where, I may say, I saw it almost daily each season. None of the Hawk tribe, in fact, were more numerous, excepting the Harrier and Sparrow-hawk. In this part of the country, neither the Rough-legs nor the Red-tails are common, and Swainson's Buzzard chiefly represents the genus. The bird may consequently be studied satisfactorily, both with regard to its habits, and to those great changes of plumage which, before they were understood, were so perplexing, and caused several nominal species to be proposed.

Swainson's Buzzard may be found anywhere in the region indicated. When about to alight on the ground in open country, it generally takes advantage of some little knoll as an observatory whence to watch for the gophers. But it gives the preference to wooded regions, and is always most numerous in the vicinity of streams fringed with trees. The nest is usually placed in trees, sometimes in shrubbery, but when both these fail, is placed on the brink of a cut-bank, or on some shelf projecting from its face, like those of most other Hawks under the same circumstances. These ground nests are apt to be less bulky and elaborate than those constructed in trees; and there is always a wide latitude in this respect, according to the precise character of the site selected. During the first season I was too late for eggs, when I first met with the birds, but discovered several nests in the timber along the Mouse River. The only one I found with anything in it contained two half-fledged young; it was very untidy with the scurfy exfoliation from the growing feathers of the youngsters, their excrement, and remains of their food in the shape of gophers. Previous to this time, in July, an unfledged young was brought to me, and early in August I possessed a full-grown bird of the year. There is evidently then a wide extension of the breeding-season, unless two broods are reared, which seems not unlikely.

During the season of 1874, I took plenty of eggs. Wherever there were trees, the birds preferred them. In the Milk River country, they nested on the cut-banks. I never found more than two eggs in a nest, and supposed this to be the usual number. In one case of a single egg, supposed to be of this species, incubation was advanced. All these eggs, excepting an addled one found in a deserted nest the latter part of August, were taken between June 21st and July 17th. The eggs depart from the rule in this genus, in being nearly colorless and unmarked, resembling hens' eggs quite closely, both in size and shape. Most of the specimens taken were uniform dull white, with no more evident markings than such obsolete grayish spots as frequently appear on Marsh Harriers' eggs. A few were marked with obvious dirty-brownish scratchy spots at the smaller end; none were marked all over, nor strongly blotched anywhere.

The food of these Hawks seems to consist principally of gophers (*Spermophili*), which they pounce upon when caught away from home, or lie in wait for at the mouths of the burrows, ready to "yank" them out with a quick thrust of the talons when they show their noses. But they also feed largely upon grasshoppers, with which their crops are sometimes found crammed. They cut a very ridiculous figure when skipping about over the prairie after these lively insects. A more extended notice of the habits of the species, with descriptions of its various plumages, may be found in my paper in the "American Naturalist" for May, 1874 (pp. 282–287), and in the article in the "Birds of the Northwest".

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3289	....	Fifty miles west of Pembina Mts.	July 15, 1873	Elliott Coues	......	......	......	Two eggs (?).
3355	....	Turtle Mountain, Dak.	July 23, 1873	... do	......	......	......	Skin.
3526	♀	Mouse River, Dak ..	Aug. 15, 1873	... do	22.00	54.00	17.00	Skin: eye brown; cere and feet yellow; bill and claws bluish-black.
3527	....	....do	......do	....do	......	......	......	} Young from nest of 3526.
3528	....	....do	......do	....do	......	......	......	
3572	♀	....do	Aug. 24, 1873	....do	19.00	49.00	13.25	Skin.
3587	♀	....do	Aug. 27, 1873	....do	21.00	53.00	15.75	....do.
3590	....	....do	Aug. 29, 1873	....do	20.50	45.50	15.60	....do.
3591	....	....do	Aug. 30, 1873	....do	21.50	51.75	......	....do.
3717	♀	....do	Sept. 3, 1873	....do	20.50	51.00	15.25	....do.
3728	♂	Long Coteau River, Dak.	Sept. 8, 1873	....do	19.25	49.00	15.25	....do.
3739	....	....do	Sept. 9, 1873	....do	20.50	50.00	15.25	....do.
3740	....	....do	......do	....do	19.50	49.00	15.00	....do.
4013	....	Big Muddy River, Mont.	June 21, 1874	....do	......	......	......	Two eggs (tree).
4036	....	Quaking Ash River, Mont.	June 26, 1874	....do	......	......	......	....do.
4116	....	Near Mouth Milk River, Mont.	June 30, 1874	....do	......	......	......	One egg (?) (tree).

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4230	....	Two Forks Milk River, Mont.	July 16, 1874	Elliott Coues.	......	......	......	Two eggs (nest on the ground).
4231	....	....do	July 17, 1874	....do	......	......	......	....do.
4422	....	West of Sweetgrass Hills, Mont.	Aug. 12, 1874	J. H. Batty	......	......	......	Skin (melanistic).
4439	....	Headwaters Milk River, Mont.	Aug. 13, 1874	....do	......	......	......	Skin.
4454	....	....do	Aug. 15, 1874	....do	21.50	49.75	15.25	Skin (melanistic).
4455	♀	....do	.....do	....do	21.25	52.00	16.00	Skin.
4509	....	Rocky Mountains, lat. 49°.	Aug. 17, 1874	Elliott Coues.	......	......	......	....do.
4510	....	....do	.....do	....do	......	......	......	....do.
4511	....	....do	.....do	....do	......	......	......	One egg (addled).
4635	♂	... do	Aug. 29, 1874	....do	......	......	......	Skin.

ARCHIBUTEO FERRUGINEUS, (*Licht.*) *Gray.*

FERRUGINEOUS BUZZARD.

This large and handsome Hawk was found breeding on the Pembina Mountains by one of Lieut. F. V. Greene's party, who secured two fledged young ones early in July, and brought them into camp, where they were kept as pets for some time. Their great size induced the general belief that they were "eagles"—an impression which my assertions to the contrary may have weakened in the minds of those who had some faith in me, *quâ* ornithologist, though others, more confident, seemed to have said faith somewhat disturbed. I was obliged to compromise with the remark that they might after all make pretty good eagles for a "topog. outfit", though they could not pass for such royal birds in my own camp. Later in the following season, the species was again found breeding on the Two Forks of Milk River, being one of the quartette of great Hawks which had their nests together on the cut-banks of the stream, as mentioned in a preceding paragraph. July 18, one of the parents and the two young birds, just fully fledged, were secured. I did not visit the nest, which, I was informed, was situated at the brink of one of the highest embankments. The species has already been reported, by Capt. T. Blakiston, R. A., from the region of the Saskatchewan. The present quotation, from the Pembina Mountains, is the northeasternmost to date, and considerably extends the known range of the species.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4235	....	Two Forks of Milk River, Mont.	July 18, 1874	Elliott Coues.	......	......	......	Skin; parent of Nos. 4236, 4237.
4236	....	... do	....do	....do	......	......	......	Skin (nestling).
4237	....	....do	....do	....do	......	......	......	....do.

AQUILA CHRYSAËTUS, (*Linn.*)

GOLDEN EAGLE.

The Golden Eagle, though an inhabitant of the region at large, was only observed in one locality, at the Sweetgrass Hills, where one or more were seen very frequently. On one of the small affluents of the Milk River, a little west of the hills, two nests were found, built directly on level ground, yet at the brink of a cut-bank, which seemed to answer as the apology for the crag to which the bird usually resorts. Although the nests were empty and deserted, there can be no reasonable doubt of their belonging to the Golden Eagle—they were far too large to be those of any Hawk, and there was no trace of the presence of Bald Eagles in this dry country. One that I examined carefully was placed on the edge of a very slight embankment, not so steep that I could not easily walk up to it. It was rather on the brow of a hillock than on the brink of a cliff. It was composed of sticks, some as large as a man's wrist, brushwood, and bunches of grass and weeds, with masses of earth still adhering to the roots. The diameter was about four feet in one direction and three in the other, owing to the conformation of the ground. The mass of material averaged about six inches in depth. The other nest was described to me as considerably larger. Both were empty and apparently deserted.

HALIAËTUS LEUCOCEPHALUS, (*Linn.*) *Savig.*

BALD EAGLE.

While steaming down the Red River from Morehead to Pembina, we frequently saw Bald Eagles sailing overhead, and several nests were noticed upon the tops of tall, isolated trees as we passed along. Upon one of the nests the parent was observed sitting, but whether incubating or brooding her young could not of course be ascertained. This was the last week in May. There was a young bird in the gray plumage in confinement at Fort Pembina, and I was informed that it had been procured in the vicinity.

Three "kinds" of Eagles, aside from the Golden Eagle, which is not generally very well known in the United States, are usually recognized by the people, who can hardly be convinced that they are stages of plumage of the present species: these are the "black", "gray", and "bald" Eagle—names which respectively indicate the plumages of the first, second, and third years of the bird's life.

CATHARTES AURA, (*Linn.*) *Ill.*

TURKEY BUZZARD.

Frequently seen in the Red River region. My note-books make no mention of its occurrence during the second season, but it is not to be supposed absent, even if it was not observed. It is probably not resident in this country, and I saw none during the colder months at F

Randall, where it was first noticed, during the spring of 1873, about the middle of April.

ECTOPISTES MACRURA,[*] (*Linn.*) *Coues.*

WILD PIGEON.

Countless flocks of Wild Pigeons pervaded the atmosphere of the Red River Valley during the latter part of May and early portion of June, 1873. We observed them continually during our voyage down the river, and for some days afterward at Pembina, streaming through the air in endless succession of flocks. They generally flew high, far beyond gunshot, but in early morning and just before nightfall often came low enough to afford a shot. The woods along the river were filled with the stragglers, which of course could be easily secured. They breed here in limited numbers, but no general "pigeon-roost" was formed in the immediate vicinity. I took one nest, containing a single egg, June 13. A few of the birds straggled westward to Turtle Mountain, where one was shot in July. The next season none was seen in any part of the Missouri or Milk River region; but in the Rocky Mountains the species was again met with in small numbers, and a young bird, doubtless bred here, was secured at Chief Mountain Lake.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2836	....	Pembino, Dak	June 4, 1873	Elliott Coues	......	......	......	Skin.
2913	...	....do	June 7, 1873	....do	......	......	......	....do.
2964	♀	....do	June 13, 1873	....do	......	......	......	....do.
2975	♂	....do	June 14, 1873	....do	17.00	23.50	8.50	....do.
......	....	Turtle Mountain, Dak.	July —, 1873	....do	......	......	......	....do.
4587	....	Rocky Mountains, latitude 49°.	Aug. 23, 1874	....do	......	......	......	....do.

ZENÆDURA CAROLINENSIS, (*Linn.*) *Bp.*

CAROLINA TURTLE DOVE.

Common at Pembina in June, and again observed the following season on the Upper Missouri.

TETRAO CANADENSIS FRANKLINI, (*Dougl.*) *Coues.*

FRANKLIN'S SPRUCE GROUSE.

This variety of the Canada Grouse or Spruce Partridge is characteristic of the Northern Rocky Mountains, where it was seen, and where several specimens were secured in August, 1874. It was not seen in the foothills, even in apparently eligible situations, nor until we were fairly in the mountains, among the timber and dense windfalls, where it was rather common in the vicinity of our camp at Chief Mountain Lake.

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[*] *Columba macroura* LINN. SN. ed. x, 1758, 164. (KALM, Beskrifning på de vilda Dufvor, Som somliga år i så otrolig stor mykenhet komma til de Sôdra Engelska nybyggen i Norra America. < Kongl. Svenska Vetensk.-Acad. Handl. xx, 1759, pp. 275–295.—See also Catesby, pl. 23; Edwards, pl. 15.)
Ectopistes macrura COUES, BNW. 1874, 766.—AUGHEY, First Ann. Rep. U. S. Entom. Comm. 1878, App. p. [46].

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4529	♀	Rocky Mountains, latitude 49°.	Aug. 20, 1874	Elliott Coues.	18.25	28.00	8.50	Skin.
4530	♀	....do	......do	....do	17.50	26.75	8.30	....do.

TETRAO OBSCURUS RICHARDSONI, (*Dougl.*) *Coues.*

RICHARDSON'S DUSKY GROUSE.

The remarks made under head of the last species apply equally well to the present, which was found in the same situation. It appeared to be rather the more numerous of the two. A large number of individuals were shot for sport or for food by various members of the party.

There is no doubt that a species of Ptarmigan, *Lagopus leucurus*, inhabits the higher elevations of the Rocky Mountains in this latitude.

While at Pembina, I was assured of the existence of a species of "Wood Grouse", different from the Spruce Partridge, or "Black Grouse", in the mountains of the same name. This statement, I presume, refers to *Bonasa umbellus*. No Ruffed Grouse of any variety were seen in the Rocky Mountains, but probably only through default of observation, as the *B. umbelloides* is an inhabitant of this region.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4540	♀	Rocky Mountains, latitude 49°.	Aug. 21, 1874	Elliott Coues.	19.50	28.00	8.50	Skin.
4541	....	....do	.....do	....do	17.50	25.40	8.00	...do.
4544	....	.. do	.....do	.. do	.....	......	.....	...do.

CENTROCERCUS UROPHASIANUS, (*Bp.*) *Sw.*

SAGE-COCK; COCK OF THE PLAINS.

The entire absence of this species from the Red River region is one of the characteristic points of distinction between this watershed and that of the Missouri. No Sage-cocks were seen during the first season, not even within the Missouri Coteau, in the vicinity of Fort Stevenson. Though the climatological conditions are the same as those of some regions where they abound, yet we miss the peculiar aspect of the sage-brush country to which they cling so pertinaciously. Upon leaving For

Buford, during the second season, we soon entered a favorable tract where the birds were tolerably common, and where several specimens were secured. At this time, the last week of June, the chicks were already flying smartly, having attained on an average the size of quails. The birds were traced to the mouth of the Milk River. Further west and north, the country seems to be too open for them, and no more were noticed.

It is a great mistake to suppose that this bird feeds entirely upon sage, as has been repeatedly asserted. A number of young birds which I opened, shot near the mouth of the Milk River, had the craw full of some kind of small aquatic beetle, which they had gleaned from a marshy spot near by, with only traces here and there of vegetable matter. Others had the crop stuffed with grasshoppers.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4071	♀	Wolf Creek, Mont	June 27, 1874	Elliott Coues	22.50	37.50	10.50	Skin.
4072	....	do	do	do	....	....	....	Skin (chick).
4073	....	do	do	do	....	....	....	do.
4074	....	do	do	do	....	....	....	do.
4075	....	do	do	do	....	....	....	do.
4122	....	Near mouth Milk River, Mont.	July 1, 1874	do	....	....	....	do.

PEDIŒCETES PHASIANELLUS COLUMBIANUS, (*Ord*) *Coues.*

SHARP-TAILED GROUSE; "PRAIRIE CHICKEN."

The whole of the region surveyed during my connection with the Commission lies beyond the range of the true Prairie-hen (*Cupidonia cupido*); while the Sage-cock, as just said, is confined to a limited portion of the Missouri country in the latitude of 49°. This leaves the field clear to the Sharp-tailed Grouse, which replaces the Prairie-hen, and abounds throughout the region from the Red River to the Rocky Mountains. In the "Birds of the Northwest", I carefully traced the general distribution of the species, particularly along the line where it inosculates with the range of the *cupido*. To this account I would refer for particulars not here given, as well as for a careful description of the various changes of plumage and other points, to give which would exceed the due bounds of the present article.

In the latitude of Pembina, the Chickens begin to lay the latter part of May or first of June. The first two weeks of the latter month are at the height of the laying and setting season. The earliest egg I procured was one cut from the parent June 4; but within a day or two a full set of eleven was found. Thirteen was the largest number secured in any one clutch; the smallest, among those in which incubation had progressed, was five. Average measurement of thirty specimens is

1.75 by 1.25; extremes of length, 1.80 and 1.60; of breadth, 1.30 and 1.20. When the shell is first formed, it is of a pale, dull greenish color; but before the egg is laid it acquires a drab or olive color by mixture of brown pigment with the original shade, and finally gains a uniform sprinkling of dark brown dots. The nests are found in various situations. Some are made out on the bare prairie, far from any landmark; others in moister tracts overgrown to willow-bushes. The first chicks I saw were caught on the 19th of June; these were newly hatched. They are very expert in hiding from the time they leave the shell. On threatened danger, the mother alarms them with a peculiar note, when they instantly scatter and squat; the mother then whirs away, but not until assured of their safety. The feathers of the wings and tail sprout first to replace the down, as in the case of the domestic fowl, in striking contrast to the growth of water-fowl, which become pretty well feathered long before their wings are serviceable for flight. The next feathers after the wings and tail are some on the poll; next appear strips of feathers on the breast and back; and with the completion of the process a plumage is assumed which lasts through part of September. In consequence of the rapid growth of the wing-feathers—a wise provision for the safety of birds until then exposed to numerous dangers—the young take short flights in a few weeks. I saw them beginning to top the bushes early in July; most of them fly quite smartly by the middle of this month, being then about as large as Quail (*Ortyx*), though some of them do not grow to this size for a month subsequently, showing a considerable range of variation in the time of hatching. I doubt that two broods are reared in a season, except perhaps in case of an accident to the first family; and for that matter, the birds seem to have all they can do to get a single set of chicks off their hands.

The plumage last mentioned is retained during the greater part of September, and is unmistakable evidence of immaturity. The birds are "fit" to shoot, in one sense, from the time they are two-thirds grown, and afford sport enough of a certain grade; but they ought to be let alone, unless one merely wishes *food*, until the moult, which occurs some time in September, is completed. They then acquire a clean, fresh, and crisp plumage, differing decidedly from that before worn, and come into prime condition. The old birds, which are in woful plight by midsummer, have by this time also accomplished the moult and come into fine feather again. The change in either case is gradual and protracted, and at no time are the birds deprived of flight, like ducks at the same trying period.

To ascertain the food of this grouse during the summer, as well as that of other species, is a matter of more than simple curiosity. The service they render in destroying grasshoppers, too often overlooked, cannot be too strenuously insisted upon, or too prominently brought to notice. I have sometimes been tempted to believe that the increasing numbers of the scourge may be due, in part at least, to the wholesale destruction of summer grouse (both this species and the Pinnated), at the period when their services are most valuable. I have of course, in my proper official capacity, killed and opened great numbers of the birds during the whole season; and I almost invariably found their crops stuffed with grasshoppers, the only other contents being buds or flowers or the tops or succulent leaves of various plants, and small numbers of beetles, spiders, or other insects. At the height of the grasshopper season, however, the birds appear to eat scarcely anything else, and each crop will contain a large handful. If an army of grouse could be mustered and properly officered, they would doubtless prove more effectual in abating the pest than any means hitherto tried.

In the winter, according to my observations made at Fort Randall, the food of the grouse consists chiefly of cedarberries and other hard fruits that persist, and the sealed buds of various amentaceous trees.

During the latter part of September or early in October, when old and young have both finished the renewal of their plumage, and the family arrangements are foreclosed, the habits of the birds are considerably modified,—in nothing more than in the degree of shyness they exhibit. During the summer, also, they are rarely seen on trees, or on the open prairie, except in the vicinity of wooded or brushy tracts to which they may retreat. Now grown more confident, they scatter over the high prairie to feed, following up the ravines that lead from the watercourses, and in the afternoon returning to roost in the tops of the tallest trees. These daily excursions and returns may be very plainly noted along the Missouri, where the cottonwood bottoms are sharply divided from the limitless prairie. During the winter, especially when the ground is covered with snow, their arboreal habits are confirmed. The birds then hug the timber, and sometimes, on lowering or stormy days, remain motionless on their perches for hours together.

Along the Missouri, above the Yellowstone, the birds were seen in considerable numbers during the second season; but they were scarcely so common as along the Red and Mouse Rivers. Small chicks were seen the latter part of June. In the still more arid and forbidding region through which the northern affluents of the Milk River flow, there were fewer still; days sometimes passed without my seeing any. In the better country about the Sweetgrass Hills, they recurred in sufficient numbers to afford fair sport; in the eastern foothills of the Rocky Mountains, they were almost as numerous as anywhere else. They occur in the mountains up to an altitude of at least 4,200 feet, where they meet, at the bottom of the coniferous belt, the Spruce Partridge and Dusky Grouse. All three of these birds were common about our camp at Chief Mountain Lake.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2848	....	Pembina, Dak	June 4, 1873	Elliott Coues.	......	......	......	Egg cut from oviduct.
2898	....	do	June 6, 1873	do	......	......	......	Set of 11 eggs.
2899	....	do	do	do	......	......	......	Set of 5 eggs.
2914	....	do	June 7, 1873	do	......	......	....	Skin.
2934	....	do	June 11, 1873	do	......	......	......	Set of 11 eggs.
3004	....	do	June 16, 1873	do	18.00	27.00	8.00	Skin.
3041	♀	do	June 18, 1873	do	......	......	......	Skin and 12 eggs.
3047	♂	do	June 19, 1873	do	19.00	26.00	8.50	Skin.
3059	....	do	do	do	......	......	......	Skin (chick).
3060	..	do	do	do	......	......	......	do.
3099	♀	do	June 22, 1873	do	......	......	......	Skin.
3100	...	do	do	do	......	......	......	Skin (chick).
3110	....	do	do	do	......	......	......	Set of 5 eggs.
3159	....	do	June 25, 1873	do	......	......	.....	Skin (chick).
3160	....	do	do	do	......	.....	......	do.
3161	....	do	do	do	......	......	......	do.
3221	....	do	June 30, 1873	do	......	......	......	do.
3222	....	do	do	do	......	......	......	do.
3223	....	do	do	do	......	......	......	do.
3226	....	do	July 5, 1873	do	......	......	......	do.
3227	....	do	do	do	......	......	.....	do.
3241	....	Pembina Mts., Dak	July 13, 1873	do	......	......	......	do.
3335	♂	Turtle Mt., Dak	July 20, 1873	do	......	......	......	Skin.
3354	....	do	July 23, 1873	do	......	......	......	do.
3380	....	do	July 30, 1873	do	......	......	......	do.
3573	....	Mouse River, Dak	Aug. 24, 1873	do	17.00	28.00	......	do.
4014	♀	Big Muddy River, Mont.	June 22, 1874	do	......	......	......	do.
4015	....	do	do	do	......	......	......	Skin (chick).
4016	....	do	do	do	......	......	......	do.
4076	....	Wolf Creek, Mont.	June 27, 1874	do	......	......	......	do.
4077	....	do	do	do	......	......	......	do.
4512	♂	Rocky Mountains, latitude 49°.	Aug. 18, 1874	do	......	......	......	Skin.

CHARADRIUS FULVUS VIRGINICUS, (*Bork.*) *Coues.*

AMERICAN GOLDEN PLOVER.

No Golden Plovers are seen in summer in any portion of the region explored. They pass through in large numbers during the vernal migration, in the month of May, and return again in the fall—the latter part of September. They were very abundant at this time along the Mouse River, and in fact on the prairie at large, for they scatter indiscriminately over large tracts, feeding upon the grasshoppers. Many were shot for food, to replenish a larder upon which four months' steady attention had made serious inroads. At this season, they were in excellent order, and proved very acceptable.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3828	♂	Mouse River, Dak	Sept. 27, 1873	Elliott Coues.	10.75	22.50	7.00	Skin; weight, 4½ oz.
3829	♀	do	do	do	10.10	22.50	7.10	Skin.

ÆGIALITIS VOCIFERA, (*Linn.*) *Bp.*

KILDEER PLOVER.

Abundant thoughout the summer in all suitable places; and as it is not a fastidious bird, it seemed to be satisfied anywhere near water, though hardly upon the dry plains, like the following species. A nest with eggs was taken June 30 near the mouth of Milk River—rather, the eggs were taken from a slight depression on the pebbly margin of a stream, which answered for a nest.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2950	....	Pembina, Dak	June 11, 1873	Elliott Coues	......	......	......	Skin.
4031	....	Quaking Ash River, Mont.	June 26, 1874	....do	......	......	......	....do.
4107	....	Near Mouth Milk River, Mont.	June 30, 1874	....do	......	......	......	Four eggs.
4387	....	West of Sweetgrass Hills, Mont.	Aug. 10, 1874	....do	......	......	......	Skin.
4494	....	Rocky Mountains, latitude 49°.	Aug. 16, 1874	J. H. Batty...	......	......	......	....do.

ENDROMIAS MONTANUS, (*Towns.*) *Harting.*

MOUNTAIN PLOVER.

The occurrence of this bird in the Milk River country, along the parallel of 49°, where it was breeding in considerable numbers, is a matter of interest, as fixing the northernmost points at which the species has thus far been observed. It does not appear to enter the Red River Basin, nor did I see it in the immediate vicinity of the Missouri below the mouth of Milk River. At this point, it was first seen July 1, and it was traced thence across the country nearly to the Sweetgrass Hills, beyond which it was lost. Its centre of abundance in this region was the vicinity of Frenchman's River, where many specimens, both adult and young, together with a set of three eggs, were secured during the first and second weeks in July. Three I believe to be the usual number. The birds seem to be at no time very wary or suspicious, and when they have a nest near by, or are leading their young over the prairie, they will scarcely retreat before threatened danger. Upon invasion of their breeding-places, they utter a singular, low, chattering cry, quite unlike the usual soft, mellow whistle, fly low over the ground to a short distance, or run swiftly for a few paces, and then stand motionless, drawn up to their full stature. The chicks are white beneath, curiously variegated in color above, with naked livid spaces about the neck. Almost from the first, they are difficult to capture alive; at the note of warning from the parent, they scatter with amazing celerity, and soon squat, when they become at once invisible, even in the scantiest herbage of the prairie. The nesting period is protracted, for at the time I took nearly fresh eggs, well-feathered young, shifting for themselves, had already been observed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4120	....	Near mouth of Milk River, Mont.	July 1, 1874	Elliott Coues.	......	......	......	Skin.
4131	....	Frenchman's River, Mont.	July 4, 1874	....do	......	......	......	....do.
4132	♂	....do	... do	... do	......	......	......	... do.
4133	....	....do	.....do	....do	......	......	......	Skin (young).
4182	....	Near Frenchman's River, Mont.	July 9, 1874	....do	......	......	......	Set of 3 eggs.
4188	....	....do	.....do	....do	......	......	......	Skin.
4189	♀	....do	.....do	....do	......	......	......	Skin (parent of Nos. 4090–2).
4190	....	....do	.....do	....do	......	......	......	Skin (chick).
4191	....	....do	.... do	....do	......	......	......	....do... do.
4192	....	....do	.....do	....do	......	......	......	....do... do.
4210	....	....do	July 10, 1874	....do	......	......	......	Skin.
4211	....	....do	.....do	....do	......	......	......	... do.
4219	....	Near Two Forks of Milk River.	July 13, 1874	....do	......	......	......	....do.
4220	....	....do	.....do	....do	......	......	......	....do.
4229	...	Two Forks of Milk River.	July 16, 1874	....do	......	....	......	....do.
4260	....	Crossing of Milk River, Mont.	July 23, 1874	....do	......	......	......	....do.

RECURVIROSTRA AMERICANA, *Gm.*

AMERICAN AVOCET.

Not observed in the Red River region, but found breeding in great abundance in the Milk River country, where it seemed specially fond of the alkali pools, that are too numerous for the traveller's comfort. It is one of the most conspicuous birds of the saline region, and may be recognized at any distance by its resemblance to a Crane in miniature. Its loud voice is peculiar, and the clamor is incessant when the breeding-places are invaded. The bird nests rather early, as by the first week of July, when I first encountered it at Frenchman's River, the young were already fledged, and by the middle of the month were on wing. At this age, they show a curious enlargement of the shank, which is swollen to much greater calibre than that of the tibia. The birds being abundant, and also very unsuspicious, a fine series of specimens was readily secured. They were generally observed in flocks of half a dozen to two dozen, wading about in the shallow water, often beyond gunshot from the shore, and at such times presenting a singularly pleasing and picturesque appearance. On getting beyond their depth, they begin to swim without difficulty, and frequently alight directly on deep water. They feed by immersing the head and neck for some moments together, during which time they are feeling about with their curious bills. Their preference for the alkaline pools may be less due to the quality of the water itself than to its shallowness and stillness, and the peculiarly soft, oozy, and almost slimy condition of the bottom.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
4135	♂	Frenchman's River, Mont.	July 6, 1874	Elliott Coues.				Skin.
4136	♂	do	do	do				do.
4156		do	July 8, 1874	do	19.00	30.00	9.50	do.
4391		West of Sweetgrass Hills, Mont.	Aug. 11, 1874	do				do.
4435		Headquarters Milk River, Mont.	Aug. 13, 1874	J. H. Batty	16.50	28.00	8.25	do.
4436		do	do	do	17.50	29.75	9.00	do.
4437		do	do	do	17.00	27.75	8.00	do.
4650		do	Aug. 29, 1874	Elliott Coues				do.
4651		do	do	do				do.
4652		do	do	do				do.
4653		do	do	do				do.
4654		do	do	do				do.
4655		do	do	do				do.
4656		do	do	do				do.
4657		do	do	do				do.
4658		do	do	do				do.

STEGANOPUS WILSONI, (*Sab.*) *Coues.*

WILSON'S PHALAROPE.

Breeds throughout the country, from the Red River to the Rocky Mountains, and in suitable places common, though never observed in large numbers at any one place. I had no opportunity of observing it after August, and am inclined to think it retires southward in advance of most of the waders. Even during the latter part of August, when other waders were regularly flocking, I never saw the Phalarope in companies of more than half a dozen individuals, and it probably never makes up in large flocks, like the other two species. At Pembina, it was breeding about reedy pools and prairie sloughs in June. I was not so fortunate, however, as to discover a nest, though I searched faithfully more than once. At Mouse River, during the month of August, it was constantly seen on the pools near the stream. Newly fledged birds taken in August are altogether different from the adults in plumage and color of the naked parts. This first plumage, which strikingly resembles on the upper parts that of the *Tringa maculata*, is worn only for a brief period before it is exchanged for uniform ashy and white, which characterizes the winter state. The birds are extremely gentle and confiding during the breeding-season, and may be approached and destroyed without the slightest difficulty.

An excellent contribution to the biography of Wilson's Phalarope has recently been made by Mr. E. W. Nelson, in the Bulletin of the Nuttall Ornithological Club, vol. ii, No. 2, April, 1877, pp. 38–43.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3073	....	Pembina, Dak.	June 20, 1873	Elliott Coues.	......	......	......	Skin.
3455	....	Mouse River, Dak.	Aug. 10, 1873	....do	8.25	14.50	4.60	Skin: bill 1.10.
3456	....	......do	....do	....do	......	......	......	Skin.
3594	....	......do	Aug. 30, 1873	....do	8.30	15.30	4.60	Skin: bill black; foot yellowish.
4078	....	Wolf Creek, Mont.	June 27, 1874	....do	....	......	......	Skin.
4152	....	Frenchman's River, Mont.	July 7, 1874	....do	......	......	......	...do.
4213	♂	Near Frenchman's River, Mont.	July 12, 1874	....do	......	......	......	...do.
4214	♂	....do	....do	....do	......	......	......	...do.
4215	♀	....do	....do	....do	......	......	......	...do.
4216	....	....do	....do	....do	......	......	......	...do.
4217	....	....do	....do	....do	......	......	......	...do.
4256	....	Near Two Forks of Milk River.	July 21, 1874	....do	......	......	......	Skin (young).

LOBIPES HYPERBOREUS, (*Linn.*) *Cuv.*

HYPERBOREAN PHALAROPE.

A large pool, or little lake, lying by the trail of our party, near the eastern base of the Rocky Mountains, a day's march east of Saint Mary's River, seemed to be a favorite resort for all the waders of the region, as well as the Ducks and Geese. There were here congregated a surprising number of water-birds—both species and individuals. Of the waders, I noticed during an hour's shooting at this spot on the 16th of August two kinds of Phalarope, the Stilt Sandpiper, the Semipalmated, Least, Baird's, and the Pectoral Sandpipers, the Willet, Greater and Lesser Yellowshanks, Solitary and Spotted Tattler, in all no less than a dozen species, of which I took specimens of nearly all. It was perhaps the only still water for many miles around, and thus attracted a full congregation of the "long-legged fraternity", to say nothing of the Ducks and Geese. The Northern Phalarope was among the number, rather unexpectedly to me, seeing how early in the season it was. There were, however, but very few of this species, in comparison with the numbers of the rest. I presume these were early arrivals from the north, since it is not probable that the species breed so far south. The evidence, however, is obviously negative; and since such boreal nesters as the Waxwing and Harlequin Duck were certainly breeding in this latitude, the Phalaropes seen here may have been hatched not far away.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4495	....	Near Rocky Mountains, latitude 49°.	Aug. 16, 1874	Elliott Coues.	......	......	......	Skin.

GALLINAGO WILSONI, (*Temm.*) *Bp.*

THE SNIPE.

Snipe-shooting opened on the Mouse River the middle of September, and for two or three weeks I enjoyed as good sport of this kind as I have ever had anywhere. The birds were abundant in the usual kind of grounds, here afforded in the vicinity of the reedy pools that are strung along near the river, and some excellent bags were made. I had previously seen none of the birds, nor were any observed during the succeeding season in the Missouri and Milk River countries, where there is little to attract them.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3758	♀	Mouse River, Dak...	Sept. 16, 1873	Elliott Coues.	11. 10	19. 50	5. 25	Skin: weight, 30 oz. 5 drs.
3824	♀	....do	Sept. 27, 1873	....do	10. 00	15. 75	5. 00	Skin.
3825	♂	....do	....do	....do	11. 50	18. 50	5. 30	...do.
3826	♂	....do	....do	....do	10. 70	17. 50	5. 10	...do.
3827	♀	....do	....do	....do	11. 20	18. 20	5. 20	...do.

MACRORHAMPHUS GRISEUS, (*Gm.*) *Leach.*

RED-BREASTED SNIPE.

Observation of this species on the Mouse River during the second week in August, before the general flight of waders took place, led me to infer that it bred in this region, like several other waders not actually caught in the act. During the fall migration, in September, the birds were extremely numerous, frequenting the pools along the river in large flocks; they were unwary, apparently absorbed in their avocations, and large bags could easily be made. Out of a lot of thirty or forty killed, October 1, partly for my legitimate purposes and partly to improve our fare, I selected, carefully measured, and preserved nine individuals, the dimensions of which are subjoined in proof that the supposed *M. scolopaceus* is not a distinct species. The question is fully discussed in the "Birds of the Northwest".

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3458	....	Mouse River, Dak	Aug. 10, 1873	Elliott Coues	11. 90	19. 25	5. 75	Skin.
3459	♀	....do	.....do	....do	12. 00	20. 00	6. 00	...do.
3858	♂	....do	Oct. 1, 1873	....do	10. 25	17. 50	5. 40	...do. (bill 2.20, leg 3.40).
3859	♂	....do	.....do	... do	11. 00	18. 50	5. 65	...do. (bill 2.50, leg 3.40)
3860	♀	....do	.....do	....do	11. 25	19. 25	5. 80	...do. (bill 2.85, leg 3.85).
3861	♀	....do	.....do	....do	11. 50	19. 00	5. 73	...do. (bill 2.90, leg 4.00).
3862	♀	....do	.....do	....do	11. 75	19. 50	5. 90	...do. (bill 2.90, leg 4.10)
3863	♀	....do	.....do	....do	11. 90	19. 75	6. 00	...do. (bill 2.95, leg 4.00).
3864	♀	....do	.....do	....do	12. 25	20. 25	6. 10	...do. (bill 3.05, leg 4.10).
3865	♀	....do	.....do	....do	12. 50	19. 50	5. 85	...do. (bill 3.25, leg 4.15)

MICROPALAMA HIMANTOPUS, (*Bp.*) *Bd.*

STILT SANDPIPER.

This highly interesting species is not known to breed except in high latitudes, and has usually been regarded as rather rare in the United States. I was delighted to find it on the same lucky pool where I got the Northern Phalarope, for I had never before seen it alive. We can only surmise whether or not it had bred in the vicinity—the date was August 16; but the birds were fully flocking, and seemed to be *en route*. On repassing the pool August 29, returning from the mountains, I saw it again, and added another specimen to the half dozen secured at my first visit. In their general appearance and actions, the birds so closely resembled the Red-breasted Snipe that at gunshot range I at first mistook them for the latter, and did not recognize them until the specimens were in hand. They gathered in the same compact groups, waded about in the same sedate, preoccupied manner, fed with the same motion of the head, probing obliquely in shallow water with the head submerged, were equally oblivious of my approach, and when wounded swam with equal facility. The close structural resemblances of the two species are evidently reflected in their general economy.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4475	....	Near Rocky Mts., lat. 49°.	Aug. 16, 1874	Elliott Coues				Skin.
			.... do					....do.
4476	...	....do	.. do	....do				....do.
4477	...	....do	.....do	...do	*9.00	*16.25	*5.00	... do. *Average.
4478	....	....do	.....do	....do				....do.
4479	....	... do	.. .do	....do				....do.
4480	....	....do	....do	....do				....do.
4644	....	... do	Aug. 29, 1874	....do	... .	......	......	......do.

EREUNETES PUSILLUS, (*Linn.*) *Cass.*

SEMIPALMATED SANDPIPER.

This abundant and familiar little species was noticed at various points along the Line during the month of August.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3479	...	Mouse River, Dak.	Aug. 10, 1873	Elliott Coues.	......	......	......	Skin.
4396	....	West of Sweetgrass Hills, Mont.	Aug. 11, 1874	.....do	......	......	......	....do.
4399	....	....do	.....do	.....do	......	......	......	....do.
4400	..	....do	.....do	.....do	......	......	......	....do.

TRINGA MINUTILLA, *Vieill.*

LEAST SANDPIPER.

Observed a little earlier than the preceding species; and I should not be surprised if it bred in the immediate vicinity. Not noticed after the middle of August.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3383	....	Turtle Mt., Dak	July 30, 1873	Elliott Coues	......	......	......	Skin.
3384	....	do	do	do	......	......	......	do.
4370	....	West of Sweetgrass Hills, Mont.	Aug. 9, 1874	do	5.60	10.75	3.37	do.
4397	....	do	Aug. 11, 1874	do	......	......	......	do.
4398	....	do	do	do	......	......	......	do.

TRINGA BAIRDI, *Coues.*

BAIRD'S SANDPIPER.

During the fall migration, in the month of August, this is one of the most abundant Sandpipers in Dakota and Montana. I found it in small flocks along the Mouse River, and thence in suitable places to the Rocky Mountains; sometimes by itself, oftener mixing with several allied species. Its habits, during the season at least, do not appear to be peculiar in any respect. I observed it chiefly on the small saline pools of the prairie, generally near water-courses, but sometimes at a distance from any permanent stream. It is a very quiet, gentle bird, which may be approached with ease.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3543	♂	Mouse River, Dak	Aug. 21, 1873	Elliott Coues	7.00	15.00	4.80	Skin. Bill, eye, and feet black.
3544	♂	do	do	do	7.00	15.25	......	do.
3545	♀	do	do	do	7.25	15.25	......	do.
3546	♀	do	do	do	7.50	16.75	......	do.
3595	....	do	Aug. 30, 1873	do	7.15	15.25	4.75	do.
4385	....	West of Sweetgrass Hills, Mont.	Aug. 10, 1874	do	......	......	......	Skin.
4386	....	do	do	do	......	......	......	do.
4393	....	do	Aug. 11, 1874	do	......	......	......	do.
4394	....	do	do	do	......	......	......	do.
4395	....	do	do	do	......	......	......	do.
4433	....	Headwaters of Milk River, Mont.	Aug. 13, 1874	do	7.40	15.25	4.85	do.
4642	....	Near Rocky Mountains, latitude 49°.	Aug. 29, 1874	do	......	......	......	do.

TRINGA MACULATA, *Vieill.*

PECTORAL SANDPIPER.

Like the last species, this one is common in both Territories during the fall migration. It was first seen the latter part of July, in company with *T. minutilla*, on the pools about the base of Turtle Mountain. Some of the specimens secured were evidently very young birds of the year, but whether bred or not in the vicinity is uncertain.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3371	....	Turtle Mt., Dak	July 28, 1873	Elliott Coues.	......	......	......	Skin.
3372	....	....do	.....do	....do	......	......	......	....do.
4392	....	West of Sweetgrass Hills, Mont.	Aug. 11, 1874	....do	......	......	......	....do.
4492	....	Near Rocky Mountains, latitude 49°.	Aug. 16, 1874	....do	......	......	......	....do.
4493	....	....do	.....do	....do	......	......	......	....do.

LIMOSA FEDOA, (*Linn.*) *Ord.*

GREAT MARBLED GODWIT.

The breeding-range of this well-known bird remained until recently uncertain, and its eggs were long special desiderata of the National Museum. At Saint Paul, I saw in the collection of the Academy of Natural Sciences of that city a set which had been taken in Minnesota. The bird has been ascertained to breed also in Iowa, and I was satisfied that it did so at Pembina. The birds that I observed in this locality showed by all their actions, readily interpreted by one familiar with the subject, that they were nesting; and I did not hesitate to so assert, though I was not successful in my search for the nest. This was of date June 20, 1873. The species was not observed west of this point.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3071	♀	Pembina, Dak	June 20, 1873	Elliott Coues	......	......	......	Skin.

LIMOSA HÆMASTICA, (*Linn.*) *Coues.*

HUDSONIAN GODWIT.

While in camp at the Two Forks of Milk River, I was shown a specimen of this species, in full plumage, in the collection of my colleague, Mr. G. M. Dawson, Naturalist of the English Commission. It had been taken, I understood, some distance east of this point. I did not myself observe the species.

TOTANUS SEMIPALMATUS, (*Gm.*) *Temm.*

WILLET.

Though the specimens preserved were all taken in August alone, I occasionally observed the species at different times during both seasons, and at various points from the Red River to the Rocky Mountains. It breeds in this region—in fact, the limit of its northward distribution is only six or seven degrees beyond—as it does in suitable places throughout the United States. I have myself observed it during the breeding-season in New Mexico and North Carolina, as well as in the present region.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3460	....	Mouse River, Dak...	Aug. 10, 1873	Elliott Coues.	......	......	......	Skin.
3533	....	... do	Aug. 16, 1873	....do	......	......	......	....do.
4491	....	Near Rocky Mountains, latitude 49°.	Aug. 16, 1874	....do	......	......	......	....do.
4508	....	....do	Aug. 17, 1874	....do	......	.....	......	....do.

TOTANUS MELANOLEUCUS, (*Gm.*) *Vieill.*

GREATER YELLOWSHANKS.

Not observed until the last week in July; very abundant, in August and September, throughout the region. This and the succeeding species are almost invariably found together, and frequently associating in the same flock. Their habits are exactly the same. They are generally accounted shy and wary birds in settled districts, and so I have usually found them; but in the wilds of the West they are among the most unsuspecting of the waders, and may be approached without the slightest difficulty.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3539	♀	Mouse River, Dak	Aug. 19, 1873	Elliott Coues	......	......	....	Skin.
3560	....	......do	Aug. 23, 1873	...do	14.00	25.00	7.75	....do.
3561	....	......do	......do	...do	13.50	24.50	7.90	....do.
3580	....	......do	Aug. 24, 1873	...do	......	......	....	....do.
3581	....	......do	......do	...do	......	......	...	....do.
3586	....	......do	Aug. 25, 1873	...do	13.40	24.75	....	....do.
4286	....	Crossing Milk R., Mont	July 24, 1874	...do	......	....	....	....do.
4438	...	Headwaters Milk R., Mont.	Aug. 13, 1874	J. H. Batty...	13.50	24.25	7.60	....do.
4489	....	Rocky Mts., lat. 49°...	Aug. 16, 1874	...do	......	......	....	....do.
4646	....	......do	Aug. 29, 1874	...do	......	......	....	....do.

TOTANUS FLAVIPES, (*Gm.*) *Vieill.*

LESSER YELLOWSHANKS.

See remarks under head of the last species, equally applicable here.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3406		Turtle Mountain, Dak.	Aug. 5, 1873	Elliott Coues				Skin.
3461	♀	Mouse River, Dak	Aug. 10, 1873	do	10.25	20.75		do.
3475		do	do	do				do.
3476		do	do	do				do.
3547		do	Aug. 22, 1873	do				do.
3576		do	do	do				do.
3577		do	do	do				do.
3578		do	do	do				do.
3579		do	do	do				do.
3585	♂	do	Aug. 25, 1873	do	10.40	19.75		do.
3593		do	Aug. 30, 1873	do	10.00	19.50	6.00	do.
4287		Crossing Milk R., Mont	July 25, 1874	do				do.
4288		do	do	do				do.
4481		Near Rocky Mountains, lat. 49°.	Aug. 16, 1874	J. H. Batty				do.
4482		do	do	do				do.
4483		do	do	do				do.
4484		do	do	do				do.
4485		do	do	do				do.
4486		do	do	do				do.
4487		do	do	do				do.
4488		do	do	do				do.
4647		do	Aug. 29, 1874	do				do.
4 48		do	do	do				do.
4649		do	do	do				do.

TOTANUS SOLITARIUS, (*Wils.*) *Aud.*

SOLITARY TATTLER.

Occurs in abundance on all the pools and water-courses of the region during the autumnal migration. I have reason to believe that some may breed in this latitude. It is almost never seen in flocks, though numbers may be gathered about the same piece of water.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3407		Turtle Mountain, Dak.	Aug. 5, 1873	Elliott Coues				Skin.
3408		do	do	do				do.
3548		Mouse River, Dak.	Aug. 22, 1873	do				do.
3549		do	do	do				do.
3562		do	Aug. 23, 1873	do				do.
3563		do	do	do				do.
4289		Crossing Milk R., Mont	July 25, 1874	do				do.
4319	♂	Sweetgrass Hills, Mont	Aug. 6, 1874	J. H. Batty	9.00	17.25	5.60	do.
4320	♀	do	do	do	8.40	15.25	4.80	do.
4321	♂	do	do	do	8.40	15.80	4.90	do.
4379		West of Sweetgrass Hills, Mont.	Aug. 10, 1874	Elliott Coues				do.
4380		do	do	do				do.
4381		do	do	do				do.
4445		Headwaters Milk R., Mont.	Aug. 14, 1874	do				do.
4490		Near Rocky Mountains, lat. 49°.	Aug. 16, 1874	do				do.
4644		do	Aug. 29, 1874	do				do.
4645		do	do	do				do.

TRINGOIDES MACULARIUS, (*Linn.*) *Gray.*

SPOTTED SANDPIPER.

The ubiquitous "teeter-tail", or "peet-weet", occurs in summer throughout the region, as it does in most other parts of North America.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2836	....	Pembina, Dak	June 4, 1873	Elliott Coues.	....	....	...	Skin.
3481	....	Mouse River, Dak	Aug. 10, 1873	....do	....	...	...	....do.
4431	....	West of Sweetgrass Hills, Mont.	Aug. 12, 1874	....do	....	....	....	....do.

ACTITURUS BARTRAMIUS, (*Wils.*) *Bp.*

BARTRAMIAN TATTLER.

This interesting bird is extremely abundant over all the prairie of the Red River region. I found it upon my arrival at Pembina, June 1, and it breeds during this month. I took eggs from the second to fourth week of June, and found newly hatched birds early in July. The first week in June, a female was killed, with an egg in her ready for extrusion. During the breeding-season, they seem to scatter indiscriminately over the prairie; yet there are particular spots, generally depressed, therefore slightly more fertile, which they particularly affect. They appear to leave the country sooner than most of the waders; I saw none after the fore part of September, though the majority of the waders continued plentiful through most of this month. They make up in flocks before their departure.

In the Missouri and Milk River regions, they are not nearly so numerous—in fact, none were observed after leaving the former river; the prairie waders which breed further westward being chiefly the Long-billed Curlew.

A tolerably full and, I think, perfectly reliable biography of this species will be found in my "Birds of the Northwest".

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2847	....	Pembina, Dak	June 4, 1873	Elliott Coues.	......	......	......	Egg, cut from oviduct.
2874	♀	....do	June 6, 1873	....do	......	......	......	Contained egg. Bill yellow, with black ridge and tip: feet dull yellow: eye dark brown.
2875	♂	....do	......do	....do	11.50	22.25	6.40	Skin.
2943	♂	....do	June 11, 1873	....do	12.00	21.00	6.25	....do.
2944	♂	....do	......do	....do	11.20	22.00	6.50	....do.
2945	♂	....do	......do	....do	......	......	......	....do.
2949	....	....do	......do	....do	......	......	......	Set of 4 eggs.

List of specimens—Continued.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
2999	♂	Pembina, Dak	June 16, 1873	Elliott Coues	12.75	22.00	6.75	Skin.
3000		do	do	do	11.75	21.50	6.25	do.
3001	♀	do	do	do	12.50	22.75	6.60	do.
3002		do	do	do	12.25	21.50	6.60	do.
3003		do	do	do	12.25	22.50	7.00	do.
3016	♀	do	June 17, 1873	do				do.
3017	♂	do	do	do				do.
3018	♀	do	do	do				do.
3019	♂	do	do	do				do.
3020		do	do	do				do.
3021	♂	do	do	do				do.
3022	♂	do	do	do				do.
3048	♂	do	June 19, 1873	do				do.
3072		do	June 20, 1873	do				do.
3101		do	June 22, 1873	do				do.
3102		do	do	do				do.
3111		do	do	do				Set of 4 eggs.
3214		do	June 28, 1873	do				Skin.
3215		do	do	do				do.
3253		20 miles west of Pembina Mts.	July 14, 1873	do				Skin (young).
3334		25 miles east of Turtle Mt.	July 18, 1873	do				do.
3353		Turtle Mt.	July 23, 1873	do				do.
3540		Mouse River, Dak.	Aug. 19, 1873	do				Skin.
4030		Quaking Ash River, Mont.	June 26, 1874	do				do.
4037		do	do	do				Four eggs.
4038		do	do	do				Skin. (Parent of eggs 4037.)

NUMENIUS LONGIROSTRIS, *Wils.*

Long-billed Curlew.

Breeds in moderate numbers about Pembina, the only locality where it was observed during the first season. The next year it was found in profusion over the prairie adjoining the Missouri above Buford, and the lower portions of the Milk River and its tributaries. It seemed, like the Bartramian Tattler, to affect particular localities, where colonies of twenty or thirty pairs would take up their abode for the summer, and make the air resound with their piercing and peculiarly lugubrious cries when disturbed. They were found decidedly shy and watchful; and being naturally stout, tough birds, they proved rather hard to kill. One of the most disastrous shooting exploits I ever attempted was directed against these same birds, as some of my friends who witnessed the discouraging negative results will remember. There seems to be a considerable latitude in the period of laying; I took a fresh set of eggs July 4th, having the day previous captured some young birds.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4100		Near mouth of Milk River, Mont.	June 30, 1874	Elliott Coues				Skin.
4125		Frenchman's River, Mont.	July 3, 1874	do				Skin (young).
4130		do	July 4, 1874	do				Set of 4 eggs.

ARDEA HERODIAS, *Linn.*

GREAT BLUE HERON.

Observed during our passage down the Red River.

NYCTIARDEA GRISEA NÆVIA, (*Bodd.*) *Allen.*

AMERICAN NIGHT HERON.

One individual seen under the same circumstances as the last.

BOTAURUS MINOR, (*Gm.*) *Boie.*

AMERICAN BITTERN.

Apparently rather common on Mouse River in September, several individuals being observed and two secured.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3703	♂	Mouse River, Dak...	Sept. 2, 1873	Elliott Coues	28.00	45.00	11.00	Iris yellow; bill pale greenish-yellow, with black ridge and dark coral stripe; legs dull yellowish-green; claws brown.
3738	....	....do	Sept. 6, 1873	....do	23.50	38.00	9.50	

GRUS AMERICANA, (*Linn.*) *Temm.*

WHITE OR WHOOPING CRANE.

White Cranes were frequently observed in the Mouse River country in August, September, and October, but always at a distance; and I was not so fortunate as to secure any specimens. There is no reason to doubt their breeding in this section. To the best of my recollection, none were seen in the Missouri or Milk River region during the second season.

GRUS CANADENSIS, (*Linn.*) *Temm.*

BROWN OR SANDHILL CRANE.

Commonly observed after leaving Pembina, especially during the latter part of the season. In July, I noticed, in one of the topographical camps, the remains of a young bird, which had been caught alive. It appears to breed over the whole region, in prairie country. In the latter part of September and early in October, both this and the Whooping Crane appeared to be migrating southward, chiefly in the nighttime, when their hoarse, rattling croak often broke the stillness, or sounded strong amidst the honking of the geese, the whistling of the rushing wings of the wildfowl, and the slender pipe of the waders that completed the throng of numberless migrants.

PORZANA CAROLINA, *Linn.*

SORA RAIL.

Observed during the migration in September along the Mouse River, where it appeared to be rather common. Its nesting in this region was not determined.

FULICA AMERICANA, *Gm.*

COOT.

Extremely abundant. Almost all the pools and reedy sloughs of the prairie throughout the region from the Red River to the Rocky Mountains and Upper Missouri country generally are tenanted by one or more pairs of these very common-place birds. The sets of eggs taken varied from ten to twelve in number, and there is a good deal of difference in the coloration, the ground varying from pale clay color to light creamy-brown, while the spotting consists sometimes of mere points, sometimes of sizable spots. The first set of eggs taken, June 20, contained embryos which would have been hatched in a day or two; others, taken the first and second weeks in July, were fresh; and, again, newly hatched young were found so late as July 26. Unless two broods are reared, as is not probable, there is a latitude of a full month in the time of laying. The birds were still abundant when I left the country, the second week in October.

The nests of this bird differ a good deal in location and amount of material employed. One particularly examined at Pembina consisted of a bulky mass of stout reed-stems, about 15 inches across and 8 in depth; it was lined with the softer tops of the reeds. This one was in a slough of considerable depth; it floated on the water—rather, it was placed on a matted platform of floating, broken-down reeds, and was moored to the growing plants. Other nests, in very shallow water or around the edges of pools, were stationary.

The newly hatched young are curious-looking creatures, covered with black down striped with rich golden-yellow or orange; bill vermilion-red, black-tipped; feet dark.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3064	....	Pembina, Dak.......	June 20, 1873	Elliott Coues	......	......	......	Set of 11 eggs.
3364	....	Turtle Mountain, Dak.	July 26, 1873	....do	......	......	......	Young, newly hatched.
3365	....	... do	.....do	....do	......	......	......	do.
3858	♂	Mouse River, Dak ..	Oct. 1, 1873	....do	16.00	28.50	7.50	Skin.
4118	....	Near month Milk River, Mont.	July 1, 1874	....do	......	......	......	Set of 12 eggs.
4176	....	Frenchman's River, Mont.	July 8, 1874	....do	......	......	......	Set of 10 eggs.
4672	....	Headwaters Milk River, Mont.	Aug. 30, 1874	....do	......	......	......	Skin.

Family ANATIDÆ.

SWAN, GEESE, and DUCKS.

A few words of comment upon the general subject will place it in clearer light than that which the series of isolated remarks furnishes, and render lengthy accounts of the several species unnecessary. During the autumnal migration, vast bands of water-fowl enter Montana and Dakota from the north. The nature of the country is such that the birds stopping for rest and food necessarily come together in immense numbers; for superimposed upon their gregarious disposition is the circumstance that the water supply is precarious or isolated, the country at large wholly unsuited to their wants. The result is, that the most slender streams, often mere threads, with scarcely strength to flow, or even broken into chains of sloughs, and all the temporary water-holes formed in depressions of the prairie, become thronged with the birds. This gives an impression of extraordinary numbers of these birds, but it should be recollected that we have here the percentage of birds due to large areas concentrated in particular spots. Duck-shooting under these circumstances becomes a somewhat special branch of the art.

Another circumstance is, that the parallel of 49° is about on the edge of the breeding-ground of those species which regularly migrate northward to breed. A large number of the Ducks, and some of the Geese, as is well known, nest indiscriminately in any part of the United States; but aside from these, all of which of course occur in the present country as well as elsewhere, there are a number of species of truly boreal breeders, which begin to drop deserters at about this latitude. As a result, nearly all of the Ducks of North America, except the maritime and thoroughly Arctic ones, nest within our limits. They choose the ponds and prairie sloughs, and the little pools in the mountains; and during the latter part of the season, these places assume the appearance of a farm-yard puddle, from the quantity of droppings and cast feathers.

In general, throughout this Report, the tabular lists of specimens afford a tolerably fair index to the abundance or scarcity of the several species secured; but this fails altogether in the cases of the birds of this family, few of which seemed worth the trouble of preparing or the expense of transportation, although large numbers were shot as legitimate objects of sport or to vary our fare.

CYGNUS BUCCINATOR, *Rich.*

TRUMPETER SWAN.

Observed on a few occasions in Dakota late in September and during the first half of October, during the migration. It appears to pass chiefly by night, but I saw a small lot flying in the daytime near Fort Stevenson. The species is said to breed in the Yellowstone country, and also in Minnesota.

The other species of Swan, *C. americanus*, was not recognized, though it doubtless occurs during the migration.

The same remark applies to a species of Goose, *Anser albifrons gambeli.*

ANSER HYPERBOREUS, *Pall.*

SNOW GOOSE; WHITE BRANT.

Abundant during the migrations. On a former occasion, I noted their spring migration in Southern Dakota, at Fort Randall, from the latter part of March through most of April. In the fall, I saw none until October.

BRANTA CANADENSIS, (*Linn.*) *Gray.*

CANADA GOOSE.

Whilst steaming up the Missouri in June, 1874, I saw several broods of goslings swimming near the banks. At a pool in Montana, west of Frenchman's River, a colony had established themselves to breed; and during the time when neither old nor young could fly, several dozen were killed with clubs by some people attached to one of the surveys. The frequent nesting of the species in *trees*, in various parts of the Northwest, is perfectly well attested, though the fact did not come under my own observation. Birds apparently from the north were common along the Mouse River in the latter part of September; a few had made their appearance the last of August, and their numbers were augmented during the month.

BRANTA BERNICLA, (*Linn.*) *Scop.*

BRANT; BLACK BRANT.

Observed only during the migration.

ANAS BOSCHAS, (*Linn.*)

MALLARD.

Breeds abundantly throughout the region in suitable places. Flappers about a week old were seen at Pembina June 20.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3065	♀	Pembina, Dak	June 20, 1873	Elliott Coues				Skin; parent of Nos. 3066-7.
3066		do	do	do				Ducklings.
3067		do	do	do				do.

DAFILA ACUTA, (*Linn.*) *Jenyns.*

SPRIGTAIL.

This beautiful Duck, equally attractive on and off the table, is abundant throughout the region, not only during the fall migration, but in the summer. By the middle of August, the young birds are full-grown, in fine feather, and in the best possible condition for the table. Many pairs were found breeding in pools in the Milk River region, especially in the vicinity of Frenchman's, early in July. At this period, the young and old were equally unable to fly, as the former had not got their feathers and the latter had lost theirs. When disturbed in the pools at such time, they had the habit of creeping slyly out on the prairie, and squatting so low, like Grouse, that they were often lost, even when the herbage was quite scanty. Many were captured by hand or killed with sticks.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3068	♀	Pembina, Dak	June 20, 1873	Elliott Coues	......	......	......	Skin.
3069	♂	....do	.....do	....do	......	......	......	....do.

CHAULELASMUS STREPERUS, (*Linn.*) *Gray.*

GADWALL.

Abundant throughout the region, where it breeds, like nearly all the other *Anatinæ*. Young still unfledged were observed late in August.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3405	....	Turtle Mt., Dak.....	Aug. 5, 1873	Elliott Coues	......	......	......	Skin.

MARECA AMERICANA, (*Gm.*) *Steph.*

WIDGEON.

Abundant throughout; breeding. Young still unable to fly were seen until the middle of September.

QUERQUEDULA CAROLINENSIS, (*Gm.*) *Steph.*

GREEN-WINGED TEAL.

Extremely abundant throughout. It enters the country by thousands, in August, among the earliest arrivals of water-fowl from the north. I have little doubt that some breed in Northern Dakota; but as the only "teals'" eggs I took were not identified satisfactorily, and as I saw no birds not in perfect feather, I cannot state positively that it does so. This was a favorite bird with me for shooting for the table, where I always thought it looked better than it did in my collecting-chest. "Two and a half teal, broiled, on toast," became my well-known limit for supper; but I never succeeded in "preserving" the third bird without mutilation.

QUERQUEDULA DISCORS, (*Linn.*) *Steph.*

BLUE-WINGED TEAL.

Arrives early, in the fore part of August, like the Green-wing, and becomes very abundant. It also doubtless breeds.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3558	....	Mouse River, Dak ..	Aug. 22, 1873	Elliott Coues	......	......	......	Skin.

SPATULA CLYPEATA, (*Linn.*) *Boie.*

SHOVELLER.

Abundant throughout. Found breeding on Mouse River, where young about half-grown were taken August 10.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3480	....	Mouse River, Dak ..	Aug. 10, 1873	Elliott Coues.	......	......	......	Skin (young).

FULIGULA AFFINIS, *Eyton.*

LESSER SCAUP DUCK.

The Scaups which I found breeding numerously in the Upper Missouri and Milk River region appeared to be chiefly, if not wholly, of this species, as several species examined certainly were. At some points, they were extremely abundant, outnumbering the other Ducks.

The *F. marila* undoubtedly occurs, during the migration at least, if not also in the breeding-season.

FULIGULA COLLARIS, (*Donovan*) *Bp.*

RING-NECKED DUCK.

Specimen seen in Mr. Dawson's collection.

FULIGULA VALLISNERIA, (*Wils.*) *Steph.*

CANVAS-BACK DUCK.

The breeding resorts of this celebrated and much over-rated bird were for a long time considered uncertain, and its eggs have not long been known. They were discovered, I think, by the late Mr. R. Kennicott in the northwest part of British America. Mr. W. H. Dall speaks of the Canvas-back as breeding abundantly on the Yukon, and Dr. J. S. Newberry found it "more numerous than any other Ducks" in the Cascade Mountains in summer. At Turtle Mountain, in July, I saw several broods of partly grown young; a number were secured, with a parent bird, so that there is no doubt of the correctness of the identification. In most of the region, however, the bird is less numerous than the Red-head.

FULIGULA FERINA AMERICANA, (*Eyt.*) *Coues.*

RED HEAD DUCK.

Abundant throughout, but whether breeding or not was left undetermined. None were seen or at least recognized excepting in the migrating season.

BUCEPHALA ISLANDICA, (*Gm.*) *Bd.*

ROCKY MOUNTAIN GOLDEN-EYE.

I was greatly interested to find this species breeding in the Rocky Mountains. A brood of young, accompanied by the female, was seen on one of the little side-pools, surrounded by timber, at our camp on Chief Mountain Lake; the old bird and two of the young, out of five or six, were secured by one of the officers of the military escort, who made over the flappers to me, but seemed so disinclined to part with the old one that I did not press the matter, although I greatly desired the specimen. This is, I believe, the first recorded instance of the occurrence of the species during the breeding-season in the United States.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4542	....	Rocky Mountains, latitude 49°.	Aug. 21, 1874	Elliott Coues.	......	......	......	Skin (very young).
4543	....	....do	......do	....do	......	......	......	......do.

BUCEPHALA CLANGULA, (*Linn.*) *Coues.*

GOLDEN-EYE.

Supposed, on good grounds, to occur during the migrations, though not observed, at any rate not recognized, by myself.

BUCEPHALA ALBEOLA, (*Linn.*) *Baird.*

BUFFLE-HEAD.

This Duck is among the commonest species after the fall migration; and I have reason to believe that it nests, in limited numbers, in Northern Dakota, as it certainly does in the Milk River country. At Turtle Mountain I found young birds in July, but they were able to fly, and may not have been hatched on the spot.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3410	...	Turtle Mount'n, Dak.	Aug. 7, 1873	Elliott Coues	......	......	......	Skin.

HISTRIONICUS TORQUATUS, (*Linn.*) *Bp.*

HARLEQUIN DUCK.

It was my good fortune to determine the breeding of this Duck in the Rocky Mountains of the United States. There is in the National Collection an egg cut from a bird taken by Dr. Hayden somewhere in the mountains May 31, warranting inference of the fact here established. Broods of flappers were discovered on a clear brawling stream near the camp on Chief Mountain Lake, and several of them, including the mother of one of the broods, were secured. The nest was not found. It was probably in the hollow of a tree near the spot. The birds showed great powers of swimming and diving in the turbulent stream, where they seemed as much at home as the family of Dippers (*Cinclus*) that was seen with them. When disturbed, the old bird flew away low over the water, while others sank back quietly till only the head remained in view, much like Grebes. Some sought refuge behind and beneath a little cascade, screened by the whole volume of water that leaped over a projecting rock. One of the broods was seen swimming quietly in a pool near the lake.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4506	....	Rocky Mts., lat. 49°	Aug. 20, 1874	Elliott Coues	......	......	......	Skin.
4553	....	....do	Aug. 22, 1874	....do	......	......	......	....do.
4554	....	....do	......do	... do	......	......	......	....do.
4555	♀	....do	......do	....do	......	......	......	....do.

ERISMATURA RUBIDA, (*Wils.*) *Bp.*

RUDDY DUCK.

Common, and breeding in suitable localities throughout the region. At Turtle Mountain, it was nesting in numbers in the pools, where the young were observed, still unable to fly, the latter part of July and early in August. Several specimens of various ages were secured.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3368	....	Turtle Mt., Dak	July 28, 1873	Elliott Coues	.....	......	......	Skin (young).
3369	....	....do	....	....do	.....	......	......	
3381	....	....do	July 30, 1873	....do	.....	......	......	Skin.
3411	....	....do	Aug. 7, 1873	....do	.....	......	......	Skin (young).

MERGUS CUCULLATUS, *Linn.*

HOODED MERGANSER.

This is the only species of the genus actually observed by the Commission, though the other two doubtless also occur, at least during the migrations. It breeds in this region.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3409	♀	Turtle Mt., Dak	Aug. 5, 1873	Elliott Coues.	18.00	26.00	7.50	Skin.
3412	♀	....do	Aug. 7, 1873	....do	......	......	......	....do.
3866	♂	Mouse River........	Oct. 1, 1873	....do	18.25	26.00	7.25	....do.

PELECANUS TRACHYRHYNCHUS, *Lath.*

WHITE PELICAN.

An old female, in sickly condition, was shot from the steamer as we neared Pembina, and I heard of one or two other specimens shot on the Red River about this point in May. The species was only once again observed, namely, at La Rivière de Lac, near Mouse River, early in September. A few individuals were seen, but the locality did not appear to be a breeding-place, nor did I find any such elsewhere.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
*2773	♀	Red River, near 49°	May 31, 1873	Elliott Coues	.....	......	......	Skeleton.

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* Stomach contained about fifty crawfish (*Cambarus couesi* Streets); pouch diseased, from attacks of parasites.

GRACULUS DILOPHUS, *Sw.*

DOUBLE-CRESTED CORMORANT.

Once observed on the Red River, near Pembina, late in May.

LARUS ARGENTATUS SMITHSONIANUS, *Coues.*

AMERICAN HERRING GULL.

A specimen was shot by Mr. J. H. Batty near Fort Benton, Mont. Some of the large Gulls observed in September during our boat voyage down the Missouri may have been of this species, but all that were fully identified were *L. delawarensis.*

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
4700	....	Near Fort Benton, Mont.	Sept. 8, 1874	J. H. Batty...	......	......	......	Skin (young).

LARUS DELAWARENSIS, *Ord.*

RING-BILLED GULL.

A considerable flock of this species was seen hovering over Rivière de Lac about the middle of September, and two specimens were secured. It was not again identified to my satisfaction until the following season, when it was seen in considerable numbers on a large pool close by Chief Mountain.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3745	....	Near Mouse R., Dak	Sept. 12, 1873	Elliott Coues	......	......	......	Skin.
3746	..	....do	... do	.. do	......	......	......	....do.
4623	....	Rocky Mts., lat. 49°.	Aug. 28, 1874	J. H. Batty..	......	.....	......	....do.

LARUS FRANKLINI, *Rich.*

FRANKLIN'S ROSY GULL.

The egg of this species has been described by Prof. Alfred Newton, from a specimen taken in the adjoining British Province of Manitoba, and a specimen was shot on Turtle Mountain July 30, fully fledged, yet so young that I judged it had been hatched not far from the spot. No breeding colonies, however, of this or indeed any other Gull were observed by me in any portion of the region surveyed.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
3379	....	Turtle Mt., Dak	July 30, 1873	Elliott Coues	13.75	33.75	9.75	Skin. Bill, 1.10; tarsus, 1.65; middle toe and claw, 1.65.

HYDROCHELIDON LARIFORMIS, (*Linn.*) *Coues*.

Black Tern.

This, the only representative of the *Sterninæ* observed by the Commission, was found breeding at Pembina in June, and subsequently seen during August along the Mouse River. On one of the prairie sloughs at Pembina—the same that I have spoken of as the breeding resort of the Yellow-headed Blackbirds—a colony of perhaps twenty pairs was established. As usual during the breeding-season with Terns, the birds were very fearless when their nesting-place was invaded, and I regret to say that the colony was broken up in consequence, as I desired to secure a good series of specimens in full dress. No eggs were found until the latter part of the month. It required sharp scrutiny to discover them, as they lay, without any preparation for their reception, directly upon the soaking, matted masses of last year's reeds, and were closely assimilated in color. They were indifferently two or three in number, oftener the latter; average samples measured 1.35 in length by 0.95 in breadth. The coloration is not peculiar in comparison with that of other Terns' eggs.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
3023	♀	Pembina, Dak	June 17, 1873	Elliott Coues				Skin.
3024	♀	do	do	do				do.
3025	♂	do	do	do				do.
3026	♀	do	do	do				do.
3027	♂	do	do	do				do.
3028	♀	do	do	do				do.
3029	♀	do	do	do				do.
3030	♂	do	do	do				do.
3031	♀	do	do	do				do.
3032	♀	do	do	do				do.
3033	♀	do	do	do				do.
3034	♂	do	do	do				do.
3035	♀	do	do	do				do.
3036	♂	do	do	do				do.
3037	♂	do	do	do				do.
3038	♂	do	do	do				do.
3039	♀	do	do	do				do.
3162	....	do	June 25, 1873	do				do.
3163	....	do	do	do				do.
3164	....	do	do	do				do.
3172	....	do	do	do				do.
3186	♀	do	June 27, 1873	do				Skin, with 3 eggs.
3462	....	Mouse River, Dak	Aug. 10, 1873	do				Skin.
3463	....	do	do	do				do.
3478	....	do	do	do				do.

PODICEPS AURITUS CALIFORNICUS, (*Heerm.*) *Coues.*

AMERICAN EARED GREBE.

I was much interested to find this species (not common in collections, and until recently supposed to be exclusively Western) breeding abundantly on Turtle Mountain, one of the easternmost localities where it has been observed. Toward the latter part of July and during the first two weeks of August, the young, still unable to fly, and in charge of the parents, were observed at the locality mentioned, and at points along the Mouse River. Some old birds in full breeding-dress were secured. With these the change begins in August, but traces persist for several weeks. I noticed nothing peculiar in the habits of the species.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen, and remarks.
3367		Turtle Mountain, Dak.	July 28, 1873	Elliott Coues.	12. 50	22. 50	5. 25	Skin. Iris scarlet; edge of eyelids orange; bill black; feet olivaceous, blackish on outer side and on soles.
3392		....do	Aug. 1, 1873	....do				Skin.
3454	♂	Mouse River, Dak	Aug. 10, 1873	...do	14. 00	24. 00		....do.
3471		....do	.....do	....do	13. 10	22. 50		....do.
3529	♀	....do	Aug. 16, 1873	... do				....do.
3530	♂	....do	.....do	....do				....do.
3531		....do	.....do	....do				Skin; young of Nos. 3529–30.
3559		....do	Aug. 23, 1873	....do	12. 00	23. 50	4. 75	Skin.
3566		....do	.....do	....do	13. 25	22. 25		....do.
3574	♀	....do	Aug. 24, 1873	....do	12. 80	21. 85		....do.
3575		....do	.....do	....do				....do.
3584		....do	Aug. 25, 1873	....do	11. 30	20. 50		....do.
3716		....do	Sept. 2, 1873	....do	11. 60	22. 00	4. 75	....do.
3741		....do	Sept. 9, 1873	....do				....do.
3742		....do	.....do	....do				....do.
4670		Headwaters of Milk River, Mont.	Aug. 30, 1874	....do				....do.
4671		....do	.....do	....do				....do.

PODICEPS CORNUTUS, *Gm.*

HORNED GREBE.

Like the last species, the Horned Grebe was found breeding in the Red River region. On the 20th of June, 1873, I took a set of four newly laid eggs from one of the prairie sloughs near Pembina. They were deposited on a matted bed of decaying reeds soaking in the water. Later in the same season, during the latter part of July, newly hatched young were observed swimming on the pools about the base of Turtle Mountain. In this locality, and elsewhere, in August and September, the two species were generally found together; and both were very abundant.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
3063	....	Pembina, Dak	June 20, 1873	Elliott Coues.	......	......	......	Set of 4 eggs.
3361	....	Turtle Mountain, Dak.	July 26, 1873	....do	.....	.....	......	Skin.
3362	....	....do	....do	....do	......	......	......	....do.
3363	....	....do	....do	....do	......	......	......	...do.

PODILYMBUS PODICEPS, (*Linn.*) *Lawr.*

DABCHICK.

Observed in the same situations as the last two species, but less frequently than either of them. Chicks still unfledged were taken so late as August 7. The streaking of the head of the young bird, supposed to be peculiar to this species, and once made the basis of a new species, is shared by others, as *P. cornutus*, for example.

List of specimens.

Coll. No.	Sex.	Locality.	Date.	Collector.	Length.	Extent.	Wing.	Nature of specimen and remarks.
3413	....	Turtle Mountain, Dak.	Aug. 7, 1873	Elliott Coues	....	.....	......	Skin (young).
3455	....	Mouse River, Dak ..	Aug. 10, 1873	....do	14.00	24.75	......	Skin.

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1875. **Grinnell, G. B.** Report of a Reconnoissance of the Black Hills of Dakota, made in the Summer of 1874. By William Ludlow, [etc.] Washington. Government Printing Office. 1875. 4to. p. 121.

Zoological Report by George Bird Grinnell. Birds, pp. 85–102. Field-notes on 110 species.

ART. XXVI.—NOTES ON A COLLECTION OF FISHES FROM THE RIO GRANDE, AT BROWNSVILLE, TEXAS—CONTINUED.*

By D. S. Jordan, M. D.

A portion of the collection of fishes from the Rio Grande noticed on pp. 395–406 of this Bulletin were accidentally separated from the rest, and escaped attention until the preceding pages had gone to press. In this lot are the following additional species:—

Genus XENOTIS Jordan.

XENOTIS BREVICEPS (Baird & Girard) Jordan.

1853—*Pomotis breviceps* B. & G., Proc. Ac. Nat. Sc. Phila. p. 390.
Pomotis breviceps B. &. G., Marcy's Expl. Red River, Zool. p. 246, pl. 13, 1853.
Pomotis breviceps GIRARD, U. S. Pac. R. R. Expl. Fishes, p. 28, 1858.
Ichthelis breviceps JORDAN & COPELAND, Check List Fishes N. A. p. 138, 1876.
Xenotis breviceps JORDAN, Bull. U. S. Nat. Mus. x, p. 36, 1877.
1854—*Pomotis nefastus* B. & G., Proc. Ac. Nat. Sc. Phila. p. 24 (not *Pomotis aquilensis* B. & G.).
1858—*Pomotis popei* GIRARD, Pac. R. R. Expl. Fishes, p. 26.
Xenotis popii JORDAN, Bull. U. S. Nat. Mus. x, p. 36, 1877.

A single half-grown specimen, agreeing well with the descriptions of *nefastus* and *popii*, but not distinguishable by me from *X. breviceps*, which species seems to be generally distributed in Texas. The specimens in the National Museum labelled (by Dr. Girard?) *Pomotis aquilensis* include two species, the one a *Xenotis*, and probably identical with *Xenotis breviceps*, the other a *Lepiopomus*, probably identical with *Lepiopomus pallidus*. The original *aquilensis* belonged to the latter type, so the name may be provisionally treated as a probable synonym of *pallidus*. The other specimens are probably those originally called *nefastus*, and seem to be referable to *Xenotis breviceps*. *X. breviceps* is closely related to *X. fallax*, but appears to be distinct.

Genus PŒCILICHTHYS Agassiz.

(*Astalichthys* Le Vaillant; *Oligocephalus* Girard.)

PŒCILICHTHYS LEPIDUS (Baird & Girard) Girard.

1853—*Boleosoma lepida* B. & G., Proc. Ac. Nat. Sc. Phila. p. 388.
Pœcilichthys lepidus GIRARD, Mex. Bound. Surv. Ich. p. 11, pl. 8, f. 14-17, 1859.
Oligocephalus lepidus GIRARD, Proc. Ac. Nat. Sc. Phila. p. 67, 1859.

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* [From p. 406, *anteà*.—ED.]

Boleosoma lepidum GÜNTHER, Cat. Fish. Brit. Mus. i, p. 77, 1859.
Boleosoma lepidum LE VAILLANT, Recherches sur les Poissons des Eaux Douces de N. A. (*Etheostomatidæ*), p. 90, 1873.
Pœcilichthys lepidus JORDAN & COPELAND, Check List, p. 163, 1876.
Pœcilichthys lepidus JORDAN, Bull. U. S. Nat. Mus. x, p. 16, 1877.

Several small specimens agreeing closely with Girard's figure and description, excepting that the spinous dorsal is higher and the two dorsals more closely approximated than is represented by him. This species appears to be a typical *Pœcilicthys*, related to *P. variatus*. The dusky transverse bars were doubtless blue in life. Girard's original types from Rio Leona, Texas, are still preserved in the museum.

Genus FUNDULUS Lacépède.

FUNDULUS ZEBRA (Girard) Günther.

1859—*Hydrargyra zebra* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 60.
Fundulus zebra GÜNTHER, Cat. Fish. Brit. Mus. vi, p. 324, 1867.
Fundulus zebra JORDAN & COPELAND, Check List Fishes N. A. p. 141, 1876.

Numerous specimens, agreeing very well with Girard's account. This species has a much larger anal fin than *Hydrargyra similis*, with which it is associated in this collection. The specimens are also much shorter and more chubby than *H. similis*, and different in coloration. The general hue is dark olive, crossed by numerous irregular, whitish zones, about as wide as the darker interspaces. These bands are quite variable in number and position, some specimens having fully twice as many as others.

The coloration is very similar to that of *Fundulus menona* Jordan and Copeland, from Wisconsin and Northern Illinois. The specimens are not in good enough condition for me to be certain as to the number of branchiostegals. I, however, count five, and therefore refer the species to *Fundulus* rather than to *Hydrargyra*.

Genus CAMPOSTOMA Agassiz.

CAMPOSTOMA FORMOSULUM Girard.

Further specimens of this species indicate that it differs from *C. anomalum* in the smaller and more pointed head, and in the much greater compression and elevation of the body in the adult. The scales are also rather smaller than in *C. anomalum*.

Genus PIMEPHALES Rafinesque.

(*Pimephales* Rafinesque; *Hyborhynchus* Agassiz.)

PIMEPHALES NIGELLUS (Cope) Jordan.

1876—*Hyborhynchus nigellus* COPE, Rept. Lieut. Wheeler's Expedition W. 100th Meridian, p. 671.
Hyborhynchus nigellus JORDAN & COPELAND, Check List Fishes N. A., p. 147, 1876.
1878—*Pimephales promelas* JORDAN, p. 402 of the present paper (not of Rafinesque).

Examination of larger and better-preserved specimens of the species referred to on page 402 as *Pimephales promelas* shows that they do not truly belong to that species, but to Professor Cope's *Hyborhynchus nigellus*. In my opinion, the group called *Pimephales* and *Hyborhynchus* can no longer be regarded as distinct genera. The present species has entirely the appearance of *Pimephales;* in fact, it carries the peculiar form and coloration of that genus to an extreme. Its lateral line is, however, almost as complete as in *Hyborhynchus*. The tubes are, however, entirely wanting on the last four or five scales, and irregularly so on some of the scales along the sides. The description given by Professor Cope is entirely accurate. One of my specimens is, however, still blacker, the whole dorsal fin and nearly the whole head being jet-black.

Genus CYPRINELLA Girard.

CYPRINELLA COMPLANATA (Girard) Jordan.

1856—*Moniana complanata* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 200.
Moniana complanata GIRARD, U. S. Mex. Bound. Surv. Ichthyol. p. 56, pl. 31, f. 17-20, 1859.
Moniana complanata JORDAN & COPELAND, Check List Fishes, p. 153, 1876.
1856—*Moniana couchi* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 201.
Moniana couchi GIRARD, U. S. Mex. Bound. Surv. Ichth. p. 57, pl. 30, f. 21-24.
Moniana couchii JORDAN & COPELAND, Check List Fishes, p. 154, 1876.
1856—*Moniana gibbosa* GIRARD, Proc. Ac. Nat. Sci. Phila. p. 201.
Moniana gibbosa GIRARD, U. S. Mex. Bound. Surv. Ichthyol. p. 57, pl. 30, f. 9-12.
Moniana gibbosa JORDAN & COPELAND, Check List Fishes N. A. p. 153, 1856.
1878—*Cyprinella bubalina* JORDAN, present paper, p. 403.

Examination of additional specimens has shown me that the dental formula, 1–4, 4–1, noticed on my first specimen, was probably accidental, and that the reference of most or all of these deep-bodied *Cyprinellæ* to *C. bubalina* is erroneous. Girard's types of his *gibbosa* and *complanata* were from Brownsville. My specimens agree fairly with the figures of both,—decidedly best with *gibbosa*, however. The descriptions of both—as of all his species of *Moniana*—are valueless. The younger specimens agree well with the figure of *M. couchi*, which, coming from the neighboring province of New Leon, is very likely the same. I therefore unite *couchi*, *gibbosa*, and *complanata* under the oldest name, *complanata*, although, as above stated, the figure of *gibbosa* is the most satisfactory. A characteristic color marking will probably usually distinguish what I call *complanata* from related species. The membrane between the branches of the lower jaw in most specimens bears a conspicuous black spot. In a very few, however, this is silvery. *Cyprinella forbesi*, lately described by me from Southern Illinois, is a closely related species, but wants this spot, and is somewhat different in form. These small fishes are exceedingly difficult, and until some one can study a large series of fresh specimens representing the different species, any arrangement of them must be regarded as merely provisional. Dr. Girard's treatment of them is perhaps as unsatisfactory a piece of work as has yet been done in American ichthyology. Any one who doubts this may read the descriptions of *Moniana couchi*, *Moniana rutila*, and *Moniana gracilis* as given by Girard, and then, as suggested by Dr. Günther, compare with each other the two figures given of *Moniana frigida*. The descriptions are throughout worthless for purposes of identification, and the figures are executed by an artist who made in the same way all the fishes drawn "at one sitting". *Moniana alburnellus*, *Cliola*, *Meda*, *Algoma*, *Dionda*, or what not, the figures show the same physiognomy.

Genus PHENACOBIUS Cope.

(*Phenacobius* Cope; *Sarcidium* Cope.)

PHENACOBIUS SCOPIFERUS (Cope) Jordan.

1872—*Sarcidium scopiferum* COPE, Hayden Geol. Surv. Wyoming, 1870, p. 440.
Sarcidium scopiferum JORDAN & COPELAND, Check List Fishes N. A. p. 146, 1876.
Phenacobius scopiferus, JORDAN, Man. Vert. ed. 2d, p. 299, 1878.
1876—*Phenacobius teretulus* var. *liosternus* NELSON, Bull. Ills. Mus. Nat. Hist. i, p. 46 1876.
Phenacobius liosternus JORDAN & COPELAND, Check List, p. 149, 1876.

A single good specimen, apparently belonging to Professor Cope's species. The head is, however, shorter and thicker than in the types of *scopiferus*, and the body is stouter. The head is contained 4⅗ times in the length, being thus about equal to the depth of the body. I am not, however, disposed to consider it a "new species", inasmuch as in other respects it agrees with *scopiferus*. *P. mirabilis* (*Exoglossum mirabilis* Grd.) has apparently a more slender body and smaller scales. These species have much narrower lips than the typical *Phenacobii*, *teretulus*, *uranops*, etc., but *Sarcidium* can hardly be considered as a distinct genus.

Genus CARPIODES Rafinesque.

CARPIODES CYPRINUS (Le Sueur) Agassiz.

Since the remarks on this species, on page 405, were in press, I have examined a fine example of *Carpiodes grayi* Cope, collected in the Rio Grande by Dr. Loew. It is evidently identical with my specimens from Brownsville, and agrees in every respect with the figure of *Ictiobus tumidus* in the Mexican Boundary Survey. Moreover, it is not distinguishable from typical examples of *Carpiodes damalis* from the Platte River, which in turn cannot be at present separated from the Eastern *Carpiodes cyprinus*. Wherefore I propose to unite all these nominal species under the oldest name, as *Carpiodes cyprinus* (Le Sueur) Agassiz, until some positive difference is shown. The species as thus defined would range from the Delaware River to the Alabama east of the Alleghanies, thence to the Rio Grande and the headwaters of the Kansas and the Platte. It is not yet known from the Great Lake Region nor from the Ohio.

DACENTRUS LUCENS, *gen. et sp. nov.*

I find four more specimens of the small Labroid fish referred to on page 399. These are larger and in better condition than the first one, and I have been enabled to examine the lower pharyngeals of one of them. These I find to be united, as usual in this group, into a broad triangular bone, in which I am unable to find a median suture. This bone is covered with rather large, close-set, bluntish-conical teeth. As the lateral line is complete, and the scales cycloid, I place this fish among the *Labridæ*, rather than among the *Cichlidæ*, but I am entirely unable to locate it among the genera of that family known to me. Indeed, I find no description of any species on our coasts to which it bears any special resemblance. Although taken in fresh waters, and occurring in a collection of fresh-water species, it is very likely a salt-water fish. The present notice is rather to call attention to this fish than to complete its history. In describing the species, I make at present no attempt to separate its generic from its specific characters. The etymology of *Dacentrus* is δα, an intensive particle; κεντρον, a spine, in special allusion to the long second spine of the anal fin. Body ovate, strongly compressed, the form Sunfish-like, much as in the genus *Centrarchus*, the depth being contained (in young of less than 2 inches) 2½ times in the length. Head large, moderately pointed, its length 2⅞ times in that of the body, its upper outline concurrent with that of the back, not making an angle with it; mouth not large, the jaws about equal, the maxillary not reaching to the front of the orbit; upper jaw quite protractile; the lips not very fleshy; teeth in jaws moderate, conical, apparently in a single series; eye large, 3 in head, its position rather anterior; cheeks with three rows of rather large, silvery scales; opercles in all my specimens bare and silvery; none of the opercular bones serrated; gill rakers pretty long and slender, rather closely set. Branchiostegals uncertain, probably five.

Scales rather large, silvery, cycloid; their number about 5–37–11. Lateral line running high up, concurrent with the back, *continuous*, not interrupted or deflected, very distinct.

Fin-rays:—Dorsal, about XVIII, 10; anal, III, 20, or thereabouts; ventrals, I, 5; spinous portion of dorsal much longer than the soft part, the spines gradually increasing in height to about the sixth, then more gradually diminishing, the highest spine a little less than half the length of the head. Along the base of the spinous dorsal is a sheath of rather large silvery scales. Anal spines somewhat curved, the second spine considerably longer than the first and third. Pectoral fins barely reaching anal; ventral fins rather short; caudal fin so broken that its form cannot be ascertained.

Colors obliterated. The typical specimens are silvery, darker above, without distinct markings anywhere. There are five of these, varying in length from 1½ to 1¾ inches. They are doubtless the young of some fish which reaches a considerable size.

ART. XXVII.—PRELIMINARY STUDIES ON THE NORTH AMERICAN PYRALIDÆ.

I.

BY A. R. GROTE.

To Prof. P. C. Zeller, Stettin, Germany.

In the present paper I have discussed as fully as possible the structure of certain genera of North America *Phycidæ*. Several of our species are found to be destructive to forestry and agriculture. I have also described a small group, characterized by the flattened clypeus and by the male antennæ having a basal tegumentary prolongation, under the name *Epipaschiæ*. In the *Pyralididæ*, I have made some new synonymical references and generic descriptions, and also enumerated the species of N. Am. *Botis* which I have seen. I am much obliged to Doctor Packard for an opportunity of examining most of his types in this family. A sense of the obligation which science at large owes to Professor Zeller, as well as my own indebtedness to him for determinations, has prompted my dedication of this little paper.

PYRALIDIDÆ.

PRORASEA, *n. g.*

Ocelli prominent. Front with a strong clypeal protuberance, its outer face mesially impressed. Maxillary palpi linear, as long as the second joint of the labial palpi, which latter are moderately long, linear, a little flattened, with moderate third joint. The scales on the vertex depend in front of the antennæ at base. Antennæ simple, ciliate beneath. Fore wings produced at apices, with oblique external margin, entire, 12-veined; 9 out of 8, a short furcation; 4 and 5 separate, near together at base. Hind wings 8-veined; three internal veins counted as one; 4 and 5 separate, near together at base, where they are connected by a cross-vein; 5 continuous with the cross-vein closing the cell. Edge of both wings a little uneven.

This genus has a resemblance to the Noctuid genus *Acopa* of Harvey in the shape of the wings and somewhat in color. It may be distinguished by the oblique transverse lines on the fore wings, the absence of the thoracic tuft behind, and the neuration, while the clypeal protuberance is greatly more prominent. The neuration agrees with the following genus *Aedis*, except that on the hind wings veins 4 and 5 do not spring from one point. I should precede *Omphalocera* with both these Western genera.

Prorasea simalis, n. s.

♂ ♀. Ocherous, sometimes more or less fuscous or blackish, variable in tone. Fore wings with indistinct oblique lines, flecked with white. Median space ocherous, narrowed below median vein. Median lines dark, fine, the outer much projected subcostally, oblique. Subterminal space fuscous or ocherous. Subterminal shade white, more or less indistinct superiorly, with a notch on submedian fold. Discal dots with a white spot between them at the place of the reniform; this discal mark often difficult to make out. Fringes white at base, interlined. A terminal punctiform black or dark line. Hind wings smoky-fuscous, paler at base, with an external line picked out by a following pale shade, and submedially sometimes white-flecked. A terminal, blackish, punctiform line. Fringes white at base, doubly interlined. Beneath pale, soiled yellow-fuscous with fine, common, exterior line and short double lines on primaries in place of the discal mark. White shades accompany the median lines on the primaries above. Body fuscous-ocherous, paler beneath. Expanse, ♂, 22; ♀, 26 to 29 mil. Eight or ten specimens examined under the number "5939", and collected by Mr. Hy. Edwards in Oregon. Also collected by Hayden's Survey in Montana.

AEDIS, *n. g.*

Front narrow, smooth, clothed with thin, converging squamation. Ocelli prominent. Maxillary palpi linear, as long as the second article of the labial palpi, these latter narrow, with moderate third article. Male antennæ scaled above, ciliate beneath, the joints improminent. The supra-caputal scales diverge between the antennæ at base, forming two inconspicuous, decumbent tufts. Wings ample. Fore wings 12-veined; veins 4 and 5 separate, 5 near 4 from the cross-vein; 9 out of 8, a short furcation to costa. Hind wings 8-veined; 3 just before the lower angle of the cell, 4 and 5 together from the lower angle of the cell, which is closed, 8 out of 7 beyond 6. This form seems to have some resemblance to *Exarcha* in the shape of the wings. In the neuration of primaries, it agrees with *Prorasea.*

Aedis funalis, n. s.

♂ ♀. Primaries whitish-gray or brown. Outer transverse line black, distinct, inwardly oblique, a little rounded below costa. Between this and the base the markings are obsolete. Beyond it, the wing is shaded with bright brown, especially centrally. Some black streaks below apices and at internal angle before the narrow subterminal line. Fringes dark. Hind wings pale fuscous; fringes narrowly interlined. A fine, dark, sometimes punctate, terminal line. Hind border touched with fuscous. An outer transverse line distinct over the middle of the wing. Beneath with an outer common line, pale fuscous. Body whitish beneath, fuscous above. California, Mr. Behrens and Hy. Edwards, Esq. The moth expands 28 mil. In the type, the inner transverse line, very fine and indistinct, may be made out; it goes to a black shade on internal margin, connected by black scales on the edge of the wing to the base of the outer line. The black longitudinal dashes to the subterminal line below the apices are variably distinct.

STEMMATOPHORA *Guen.*

Stemmatophora nicalis, n. s.

♀. Ocelli. Maxillary palpi small. Aspect of *Asopia*. Deep reddish-fuscous; thorax and basal fields of the fore wings somewhat olivaceous. Median lines distinct, whitish. The anterior upright with a submedian, rounded, outward projection. Posterior line broadly marked on costa, outwardly rounded superiorly, running inwardly to vein 2, where it forms a slight sinus, thence more straightly to internal margin. It is defined on the inside by a narrow reddish line. Discal dots both present, appearing as darker cloud-spots. Median space a little paler than the rest of the wing, shaded with pale yellowish on the interspaces posteriorly. Beyond the line, the wing is evenly obscure reddish-fuscous; fringes paler, indistinctly interlined. Hind wings fuscous, with paler bases and a whitish, incomplete, extramesial line. Beneath paler than above; the outer yellowish line broadly marked on primaries; on secondaries, a narrow, brown, mesial line. Body pale beneath. The brown terminal spaces on both wings contrast with the paler portion within the line. Expanse, 24 mil. One specimen, in good condition. Sierra Nevada, Cal.

OMPHALOCERA *Lederer.*

Omphalocera cariosa Led., 339, taf. 6, fig. 11.

♂ ♀. Two specimens from Missouri (Riley) agree very well with Lederer's figure and description; in these there is a reddish cast to the fore wings, which is wanting in a larger female taken by myself in Alabama. Lederer gives as localities: "North America, Brazil."

ASOPIA *Tr.*

Asopia farinalis (Linn.).

New England; Middle States; also from Texas, Belfrage, No. 416, October 16. Lederer gives as localities: "Europe, America, Australia." Probably introduced by commerce.

Asopia costalis (Fabr.).

Pyralis fimbrialis S. V.

♂ ♀. This species is found, according to Zeller, but rarely in North Germany, and not at all in England. Zeller doubts that Riley and Packard, who describe the larva from American specimens found feeding in numbers on clover, really intend this species, and not *olinalis*, which latter is a purely American form. But I recollect determining the species originally for Mr. Riley, and there can be no doubt that the present species is the one they described, although in the terms used for color both Riley and Packard may have been inexact. It is not credible that they have mixed the two species in their illustrations or descriptions. It is curious that in North America the insect is more common than on the continent; and the question of its introduction is an open one. I have not seen it from Texas. The specimens before me are from New York. Lederer says that a male of this species sent him through Professor Zeller from New York agrees exactly with the European specimens.

Asopia olinalis Guen., p. 118.

Asopia trentonalis Schlaeger, Led. p. 343, taf. 7, fig. 2.

♂ ♀. Varies in size and depth of color. New York and Texas (Belfrage, No. 356).

Asopia binodulalis Zell., Beitr. 1, 501.

♂. One specimen of this species is before me. It looks like a variety of *olinalis*, but the fringes are not yellow. The outer line is a little more outwardly bent than in *olinalis*. Texas (Belfrage, No. 358).

Asopia himonialis Zell., Beitr. 1, 500.

I do not know this Massachusetts form, which is said by Zeller to have the fringes not quite so brightly golden-yellow as *costalis*, and to be as large as the largest *olinalis*. It cannot be *devialis* from the characters given to the transverse lines and the general color.

Asopia devialis Grote, Bull. B. S. N. S. 2, 229.

♂. This form is large, of a faded yellow, sometimes with a faint purple tinge, besprinkled with dark scales; the fringes are concolorous with the wing, faded ochery or yellowish. Lines dark, followed by pale shades. The outer line is denticulate, forming four or five dark points below the pale costal blotch. The costal hooklets between the lines are obsolete; with difficulty under the glass I can make out three of them. Quebec (Bélanger); Albany, N. Y. (Professor Lintner and Mr. Hill).

Asopia squamealis Grote, Bull. B. S. N. S. 1, 172, and 2, 229.

♂ ♀. Primaries deep red, sprinkled with black. Fringes on primaries blackish; on secondaries paler, both interlined; black terminal lines distinct. Wings narrow. On fore wings, the lines wide apart, exterior line slightly denticulate; the lines black, followed by faint yellow shades; between the lines are five costal dots surrounded with black scales. Hind wings blackish, with distinct exterior line and the terminal margin washed with red. Hastings, N. Y., in June; also taken by myself near Buffalo in July. A very distinct species, which I have determined myself in different collections.

ARTA *Grote.*

In this genus, the fore wings are a little squarer than in *Asopia*. The ocelli are present. Fore wings 11-veined, 4 and 5 furcate; 8 and 9 out of 7. Hind wings 8-veined, 2 before the lower angle of the cell, 3, 4, and 5 in succession from the submedian vein; cell open or partially closed, 8 out of 7 a short furcation; 6 connected with 7 by a short vein. The species are small. I only make out 2 internal veins on secondaries.

Arta statalis Grote, Bull. B. S. N. S. 2, 230.

The fore wings are vinous-red, with two narrow, upright, approximate, yellow, median lines; the inner line brought well toward the middle of the wing. Fringes darker than the wing. Hind wings fuscous. Beneath fuscous, the costæ tinged with red more or less diffused. The expanse is 16 mil. My three female specimens are all from New York.

Arta olivalis Grote, Can. Ent. x, 23.

♂ ♀. A small species resembling *statalis*, but differing by the olivaceous cast of the primaries above, crossed by two, parallel, faint, pale lines, the inner at the middle of the wing, the outer at within the middle of the outer half of the wing; fringes vinous; hind wings pale purplish, with vinous fringes. Beneath, the costal and external margins are bright wine-color, a pale common line. The expanse is 14 mil. Texas, Belfrage, in July and August (No. 405). The neuration has not been studied.

CONDYLOLOMIA *Grote.*

(Bull. B. S. N. S. 1, 176, plate 5, figs. 4, 5.)

I have again studied the neuration of this genus, in which the cell is so short on both wings. To the figure and description of the primary wing (fig. 4), I have nothing to add. The drawing of the hind wing (fig. 5) is defective in that vein 6 springs from the discal cross-vein, and not from the upper margin of the cell; the cell is closed by a concave fold. The median vein is too straight, but the branches are correctly drawn as to position. I find also only two internal nervures (Rippe 1, *a*); but in this it is possible I am wrong, although I can find only two in *Arta*.

I am indebted to the kindness of Mr. L. W. Goodell, of Amherst, Mass., for a specimen (No. 8) of the only species of this genus known, *Condylolomia participialis*.

CORDYLOPEZA *Zeller.*

Cordylopeza nigrinodis Zell., Beitr. ii, 6, taf. iii, fig. 3.

New York; near Buffalo, in July.

FABATANA *Walk.*

Fabatana oviplagalis Walk., Suppl. iv, 1265, ♀, (1865).

Asopia anthœcioides G. & R., Tr. Ent. Soc. Phil. 15, pl. 2, fig. 9, ♀, (1867).

I have before me only a single female, received from Mr. Dury (No. 13), from Cincinnati. The ocelli are present. It seems to be allied to the following genus, of which I have no material before me to examine.

SIPAROCERA *Robinson.*

Siparocera nobilis Rob., Ann. N. Y. Lyc. April, 1875.

Oecto-peria sincera Zell., Beitr. iii, 125, taf. x, fig. 45.

New York; Mr. Robinson's type (♂) I have seen in the Central Park collection.

MELANOMMA *Grote.*

Male antennæ bipectinate; the branches separate, ciliate, before their extremities bent, and with a longer exterior bristle. Ocelli present. Maxillæ moderate. Labial palpi with narrow and rather long third joint, porrect, as long as the front. Clypeus rather narrow, smooth, roundedly prominent. Fore wings with rounded costa, broad, obovate, 12-veined, 4 and 5 separate, 5 from the cross-vein near 4; 6 from the cross-vein opposite 5; 9 out of 8 a short furcation. Hind wings 8-veined; 2 from the median vein at beyond the middle; 3 and 4 from one point at the lower angle of the cell; 5 from the cross-vein well separated from 4; the subcostal vein is quite distinct from the costal (8), and throws off 6 and 7 beyond the closure of the cell; 8 entirely free, touching 7 at base, but then leaving it widely throughout its course; the cell has a median fold. I cannot detect the maxillary palpi. This genus has a resemblance to Lederer's Brazilian genus *Cryptocosma* in the pectinate antennæ and the presence of metallic marks on the gray wings. It differs very decidedly in structure, having both ocelli and maxillæ, and a totally distinct venation. The separation of 8 and 7 on the hind wings is unusually complete in *Melanomma*, except at base, where they touch without coinciding; the fact that 3 and 4 spring together from lower angle of the cell, while 5 is more widely separate, is interesting, and recalls other families; while the fore wings are like the *Pyralidæ*, the hind wings are like the *Geometridæ*. I can see also but two internal veins, but I have shown in other cases that the character of three internal veins may not be considered as invariable in the *Pyralidæ*. The body is narrow, abdomen tapering, exceeding the secondaries.

Melanomma auricinctaria Grote, Tr. Ent. Soc. Phil. 117, 1875.

♂. I have one specimen only before me, received from Mr. E. L. Graef, taken near Brooklyn, N. Y. The moth is gray, with transverse dark lines, recalling *Eupethecia*. The cell shows a black spot accompanied by metallic scales, and with a narrow yellowish iris, much more distinct and complete beneath. The subterminal line shows metallic scales on both surfaces. I have discussed this species also in Can. Ent. 28, 1876.

EMPREPES *Lederer*.

Emprepes novalis Grote, Can. Ent. 156, 1876.
Texas (Belfrage, No. 403, Oct. 7).

Emprepes nuchalis, n. s.

Size of *novalis*, but differently colored, and with the anterior and posterior bands nearer together and better defined. Olivaceous. Fore wings with a broad, even, outwardly oblique, anterior, vinous-purple band; a costal spot of the same color at the middle of the median space, and an outer, subterminal, sinuous, upright band of the same hue. Hind wings fuscous; fringes a little paler than the wing. Expanse, 17 mil. California (Hy. Edwards, No. 3011). This species is entirely olivaceous, beneath paler, and differs by the subterminal limitation of the posterior band, among other characters. I have examined two specimens. I regret not to have been able, from paucity of material, to make any neurational examination of either of the above species.

Scoparia libella, n. s.

A small gray species less than half the size of the European and American *centuriella*. Fore wings with a blackish streak at base and one on submedian fold beyond the inner line. Lines white, tolerably distinct, inner arcuate, outer a little irregular, produced medially. Discal mark a curved, longitudinal, black streak, as if connecting spots. Subterminal line incomplete, whitish. Fringe white, dotted. Hind wings smoky, with white fringes. Beneath smoky; body white; anterior tibiæ and feet dotted. This species is of common occurrence, and may be known by its olive-gray tint and small size, expanding 15 millimeters. I have it from Maine, Massachusetts, and New York.

BOTIS *Schr*.

This generic term is sometimes incorrectly written "*Botys*". Professor Zeller follows Swainson's correction of the spelling. The North American species are numerous, and the following enumeration of those before me will assist the student. Several of our species described by European entomologists remain to be identified. I do not expect, however, that most of Mr. Walker's descriptions will be ever satisfactorily made out.

1. *Botis octomaculata* (Linn.).

Ennychia glomeralis Walk., C. B. M. Pyr. 330.

United States and Europe. I have observed this species in the vicinity of Buffalo. In color, ornamentation, and flight, it closely resembles the species of *Alypia*.

2. *Botis californicalis* Pack., Ann. N. Y. Lyc. 260, (1873).

I have two specimens from San Francisco, which may belong here (Behrens). I have not seen Dr. Packard's type.

3. *Botis insequalis* (Guen.).

Herbula subsequalis || Guen., Pyr. 177, pl. 8, fig. 3.

New York; Pennsylvania.

4. *Botis generosa* G. & R., Tr. Am. Ent. Soc. 1, 20, pl. 2, fig. 10.

New York; Pennsylvania.

5. *Botis matronalis* Grote, Bull. B. S. N. S. ii, 231.

Canada. Mr. Saunders has reared this species from the larva.

6. *Botis unimacula* G. & R., Tr. Am. Ent. Soc. 1, 14, pl. 2, fig. 8.

New York; Pennsylvania.

7. *Botis volupialis* Grote, Bull. Geol. Survey, 3, 799.

Hills west of Denver, Colo.

8. *Botis signatalis* (Walk.) G. & R., *l. c.* 16, pl. 2, fig. 11.

The name *vinulenta* G. & R. has been proposed for this species in case the present proves untenable, which is probable.

Texas (Belfrage, No. 368); Massachusetts; Pennsylvania.

9. *Botis atropurpuralis* Grote, Can. Ent. 9, 104.

Texas (Belfrage, No. 362).

10. *Botis diffissa* G. & R., *l. c.* 19, pl. 2, fig. 16.

Louisiana; Texas (Belfrage, No. 368).

11. *Botis phœnicealis* (Hübn.), Zutr. 1, 58, figs. 115, 116.

Texas (Belfrage, No. 366). The specimens sent by Belfrage are "trüb purpurroth und oraniengelb"; but the bands are narrower than in Hübner's figure. There is no discal dot, as in *diffissa*, which is brilliant vinous-red and golden-yellow.

12. *Botis laticlavia* G. & R., *l. c.* 17, pl. 2, fig. 12.

Texas (Belfrage, No. 360). As suggested by Professor Zeller (Beitr. 1, 59), I regard the following as a seasonal variety.

12 *b*. *Botis cinerosa* G. & R., *l. c.* 18, pl. 2, fig. 13.

Texas (Belfrage, No. 361).

13. *Botis sumptuosalis* (Walk.), C. B. M. 34, 1281.

B. haruspica G. & R., *l. c.* pl. 2, fig. 14.
? *B. proceralis* Led., 460.

Massachusetts; Pennsylvania.

14. ***Botis onythesalis*** (Walk.), Pyr. 734.
Texas (Belfrage, No. 364).

15. ***Botis vibicalis*** Zell., Beitr. ii, 8, taf. iii, fig. 4.
Texas (Belfrage, No. 407).

16. ***Botis nasonialis*** Zell., Beitr. ii, 9, taf. iii, fig. 6.
Texas (Belfrage, No. 406, May 15). California, September 3 (Behrens).

17. ***Botis sesquialteralis*** Zell., *l. c.* 9, taf. iii, fig. 5.

Texas (Belfrage, No. 406). I think I have this species of Zeller's before me sent under the same number with the foregoing by Belfrage. It is possible that the two are not distinct; *nasonialis* may be recognized by the pale yellow streaks along the veins. These three last are the smallest species of *Botis* known to me.

(*Diastictis* Hübn.)

18. ***Botis argyralis*** (Hübn.), Zutr. 1, 21, figs. 113, 114.

I have a specimen from the South which agrees with Hübner's figure in the pale yellowish primaries. I do not find any differences except color between this and the following. But Hübner's figure has the white spots larger and visible beneath; this may be varietal, and I merely keep the names separate provisionally. I do not see the character given by Zeller to *argyralis* (p. 509) to distinguish it from *ventralis*.

19. ***Botis ventralis*** G. & R., *l. c.* 21, pl. 2, fig. 23.

Massachusetts; Pennsylvania. I have both sexes of a dark brown like the ♂ of "*argyralis*" described by Zeller on page 508. It is probable that the female, with "fast dottergelbe Vorderflügel", is the same as the *argyralis* there described, which is also a female, but which has the white, lateral, abdominal stripes continuous. Unless we can find that the color is a specific character, I do not think there are other grounds for a separation.

20. ***Botis fracturalis*** Zell., taf. iii, fig. 16.

I have two (♂ ♀) specimens agreeing accurately with Zeller's figures, except that the male has the ground-color slightly tinged with ocherous. But I have another female (Belfrage, No. 384), which differs by being as yellow as *argyralis*, whereas *fracturalis* is as brown as *ventralis*. This female has besides the basal, silver, submedian mark transformed into an upright band, and the median fascia is broader and connected with the discal spot. If this is only a variety, which I believe it is, it will assist the idea that *ventralis* and *argyralis* are only color-varieties.

††

21. ***Botis Harveyana*** Grote, Can Ent. 9, 104.
New York; Texas (Belfrage)

22. *Botis profundalis* Pack., Ann. N. Y. Lyc. 261, 1873.

California. I have examined Dr. Packard's type. The exterior line makes a broad submedian sinus, which seems to be characteristic.

23. *Botis badipennis* Grote, Bull. B. S. N. S. 1, 88, pl. 2, fig. 12.

Maine; New York; Michigan, in August.

24. *Botis tatalis* Grote, Can. Ent. 9, 106.

Texas (Belfrage, No. 659, October 7).

25. *Botis allectalis* Grote, Can. Ent. 9, 107.

Texas (Belfrage, No. 445, May 12).

26. *Botis albiceralis*, n. s.

♂. Male antennæ simple, pubescent beneath. Palpi extended forward, fully as long as the head. Head and appendages and thorax pale ocherous. Fore wings gray, with an ocherous costal patch from the base outwardly, extending downward on the middle of the wing and absorbing the stigmata, narrowly defined by a brown line. Anterior line obsolete. Posterior line near the margin denticulate, narrow, whitish, bordered with dark gray, outwardly bent superiorly, but not flexuous. Subterminal line very near the margin, followed by two apical, narrow, brown teeth; terminal space ochery; a fine, brown, terminal line; fringes pale, interlined. Hind wings pellucid whitish, stained outwardly with ocherous; a continuous, denticulate, extramesial line, not flexed; fringes pale. Beneath largely pale ocherous; a brown discal lunule on primaries; a common, denticulate, extradiscal, brownish line, accentuated on costa. Expanse, 26 mil. Colorado Rio, Prof. Townend Glover; one specimen. This species resembles somewhat *B. allectalis* in colors, but is larger, and may be known by the ocherous costal patch of primaries absorbing the reniform, which appears as a brown stain near its outer edge. This costal patch is neatly edged with a brown line back to the place of the anterior line, where it narrows to base of wing.

27. *Botis mustelinalis* Pack., Ann. N. Y. Lyc. 262, 1873.

Botis catenulalis Grote, Can. Ent. 9, 105.

California. I have compared Dr. Packard's type.

28. *Botis fodinalis* Led., 369, taf. 8, fig. 9.

California. I have examined several ♂ ♀ specimens from Behrens and Edwards. It varies in size, distinctness of lines, and color.

29. *Botis socialis* Grote, Can. Ent. 9, 107.

My two specimens (Canada and Buffalo) are females. They are brighter-colored than *fodinalis*, the subterminal band on primaries more distinct, the spots solid and more evident, the primaries more red, the secondaries more yellow. Smaller than most of my California *fodinalis*, I yet think they will prove the same species.

30. *Botis reversalis* Guen., Pyr. 409.
Texas (Belfrage, No. 389, May 13).

31. *Botis penitalis* Grote, Can. Ent. 98, 1876.
This is rather a large species, expanding 29 mil. Kansas (Snow); larva on the Yellow Pond Lily (*Nelubium luteum*). Incorrectly compared by me with *crinitalis*.

32. *Botis erectalis* Grote, Can. Ent. 99, 1876.
New York (Lintner); Massachusetts (L. W. Goodell). Differs from the foregoing by its fuscous color, distinct lines, and plain and solid discal marks, while it is a little larger (34 mil.).

33. *Botis coloradensis* G. & R., *l. c.* 25, pl. 2, fig. 18.
Colorado; Texas (Belfrage, No. 379, April 24).

34. *Botis flavidalis* Guen., Pyr. 329.
C. cinctipedalis Walk., Pyr. Sup. 1391.
New York; Ohio; Alabama; Texas (Belfrage, No. 378).

35. *Botis Langdonalis* Grote, Can. Ent. 9, 10.
This fine species is as large as *flavidalis*, and is easily known by the broad fuscous-brown bands of the wings. Ohio (Langdon, Dury).

36. *Botis flavidissimalis* Grote, Can. Ent. 9, 105.
Texas (Belfrage, No. 383, November 5, 8).

37. *Botis trimaculalis* Grote, Can. Ent. 10, 24.
Texas (Belfrage, No. 375, October 4).

38. *Botis fuscimaculalis* Grote, Can. Ent. 10, 25.
Texas (Belfrage, May 5).

39. *Botis flavicoloralis* Grote, Can. Ent. 10, 25.
Texas (Belfrage, October 11).

40. *Botis citrina* G. & R., *l. c.* 23, pl. 2, fig. 20.
Long Island, N. Y.; Pennsylvania; Texas (*teste* Zeller).

41. *Botis marculenta* G. & R., *l. c.* 23, pl. 2, fig. 21.
New York (Grote); Pennsylvania; Texas (*teste* Zeller).

42. *Botis submedialis* Grote, Can. Ent. 8, 111.
Canada (Saunders); only one specimen.

43. *Botis pertextalis* Led., 371, taf. 9, fig. 10.
New York; five specimens, perhaps not different from the succeeding form.

44. *Botis gentilis* Grote, Bull. B. S. N. S. i, 173.

Botis Thesealis Zell. (non Led.), 514.

New York; four specimens, darker, smaller than the preceding, with the lines on the veins more distinct.

45. *Botis magistralis* Grote, Bull. B. S. N. S. i, 173.

Massachusetts; New York.

46. *Botis quinquelinealis* Grote, Bull. B. S. N. S. ii, 231.

New York; Massachusetts; Pennsylvania; six specimens. I sent a specimen of this to the British Museum during Mr. Walker's lifetime, and he informed me by letter that the species was not in the English collections, and he believed it undescribed.

47. *Botis abdominalis* Zell., Beitr. 1, 515.

I have two specimens from New York, one with the reniform, the other with both stigmata open, which is allied to 5-*linealis*, and from the description may be this species.

48. *Botis feudalis* Grote, Bull. B. S. N. S. ii, 231.

New York; Massachusetts; Ohio.

49. *Botis terrealis* (Tr.).

New York (Lintner); also European.

50. *Botis penumbralis* Grote, Can. Ent. 9, 106.

Ohio (Dury).

51. *Botis obumbratalis* Led., taf. 9, fig. 17.

Maine (Packard). I have identified this species in a collection sent me some time ago by Dr. Packard, but have now no specimens before me.

52. *Botis dasconalis* Walk., Led. taf. 1, 2, fig. 5.

Maine; New York. I have identified this species, but have no specimens of my own at the present writing.

53. *Botis venalis* Grote, Can. Ent. x, 24.

New York (Buffalo, Grote).

54. *Botis magniferalis* Walk., Can. Nat. and Geol. vi, 41.

B. euphæsalis Walk., Pyr. 1008.
? *B. subjectalis* Led., taf. 10, fig. 13.

Montreal (Cooper); New York. I have identified this species as *illibalis* of Hübner (Can. Ent. 9, 28), but perhaps incorrectly. Lederer seems to distinguish the two species from specimens. Hübner's figures do not agree with this species in showing no median clouding on the fore wings above.

55. *Botis perrubralis* Pack., Ann. N. Y. Lyc. 264, 1873.

California (Packard). I have examined Dr. Packard's type of this very distinct species.

56. *Botis semirubralis* Pack., *l. c.* 263.

California (Hy. Edwards, No. 707). I have examined a number of specimens of this distinct form.

57. *Botis plectilis* G. & R., *l. c.* pl. 2, fig. 17.

Maine; New York; Pennsylvania.

58. *Botis adipaloides* G. & R., *l. c.* pl. 2, fig. 19.

Massachusetts (Prof. E. S. Morse). One specimen. I have a second from New York, which has the usually yellow parts of the wing white. It may be a different species.

From Texas I have 1 female (Belfrage, No. 381) and 2 males (Belfrage, No. 380), which are what Zeller describes under this name; they may be a distinct species. At this moment, I have not a series of our Northern form to compare them with.

59. *Botis talis* Grote.

♂. Form of *adipaloides*. Fore wings bright purple. An irregularly shaped, brown-margined, light yellow patch resting on internal margin within the middle, and projected upward on the cell; preceded on the cell by a small, partially confluent, similar spot. A quadrate patch over the veins beyond the cell open to costa, along which the yellow color spreads toward the base. Hind wings bright purple, with a very broad, yellow, central fascia, tapering inferiorly, edged with brown or black lines. Fringes pale. Beneath paler, but as above; base of hind wings entirely yellowish. Thorax brownish-purple; beneath, body and legs whitish. Expanse, 20 mil. Alabama (Grote). So brightly colored and distinctly marked that it can be mistaken for no other species. The fine dark lines edging the yellow patches on fore wings above may be taken for the ordinary lines and the annuli of the purple stigmata.

60. *Botis plumbicostalis* Grote, Can. Ent. 3, 103.

Bright yellow costal region of primaries broadly dark plumbeous or purple-brown from base to tip. Terminal space outwardly filled with the same shade tapering to internal angle. This terminal dark shade is outwardly rounded along its inner margin, and this is widely and everywhere nearly equidistant from the external transverse line; at the internal angle, there is a slight projection corresponding with the inward inferior inflection of the external line. The orbicular spot is small, solid, and absorbed above by the dark costal region, as is the reniform; the latter is small, constricted, with a dark annulus, and very narrow, pale center; both spots concolorous with the dark costal region. There is a short, dark, inner transverse line. The only other, the external, runs slightly *inwardly* below costa, then outwardly over the m. nervules, where it is slightly interspaceally dentate; thus, in its upper half it is sinuate or somewhat S-shaped. At 4th m. nervule it runs, as usual, inwardly, thence transversely to internal margin. The fringes are dark, concolorous with the terminal shade. A single line crosses the secondaries, projects over the disk, and corresponds to the external line of the primaries. A distinct discal spot. Apical angle shaded with plumbeous; fringes pale. Beneath whitish, iridescent, markings of the upper surface faintly reflected. Legs white; anterior and middle femora marked with black. Palpal tips, front and vertex, and sides of thorax in front, dark. Thorax clear yellow. Abdomen above yellowish, with a dark dorsal shade; beneath, the body parts are white. Hind legs entirely white, with two pair of unequal spurs. Expanse, 30 mil. August. Type in Museum Peabody Academy of Science, Salem, Mass.

Recalls the figures of *Eulepte concordalis* of Hübner. The fringes on primaries are not checkered, however, and there are other differences; besides, the present is a stouter form. A specimen of this species has been sent me by Mr. Schwarz, taken at Enterprise, Fla., on June 22.

61. *Botis anticostalis* Grote, Can. Ent. 3, 104.

Bright yellow, with deeper ocherous tinges. The species has the markings and appearance of *Botis plumbicostalis*. Costa of primaries broadly plumbeous, but shading to yellowish toward the tips. Ordinary spots larger, annulate, freer from the costal shade; their centers are whitish-iridescent; the ♂ has no orbicular; in its place, the tegument is somewhat pellucid and impressed. The two transverse lines are fainter and wider apart, the transverse exterior differently shaped. This is *outwardly* rounded at costa, where it is twice interspaceally lunulate, and there is always here a narrow space between it and the terminal dark shade. This latter fills in the entire terminal space superiorly (except as above mentioned) between the external line and the margin, but is obsolete inferiorly below 3d m. nervule, appearing as a spot at internal angle. Secondaries with a distinct discal spot and single, flexed, transverse line. Apices with the commencement of a dark terminal shade. Fringes on both wings pale. ♂ abdomen pointed at the tip, elongate, with dark dorsal shade; ♀ yellow above. Thorax yellow; head, palpal tips, sides of thorax before insertion of wings, dark, as in *B. plumbicostalis*. Legs whitish; anterior and middle pair shaded with blackish. Expanse, 25 mil. July, August. Types in Museum Peabody Academy of Science, Salem, Mass.

Smaller than *B. plumbicostalis*, but greatly resembling it at first sight. On a comparison, the differences above detailed are quite apparent.

This species may belong to *Crocidophora*. I have not seen the male since I described the species in 1871. My types were sent to the Peabody Museum, but they have not been well cared for. The type of the preceding species has been badly eaten by larvæ, and of the present I have been only able to see the female.

62. *Botis syringicola* Pack., Mass. Rep. 18, 1870.

"The moth, for which I would propose the name *Botys syringicola*, is peppery gray with bright yellow markings, while the under side of the wings is pale yellow. The head and body are pale gray, with a yellowish tinge, white on the under side of the body and under side of the palpi. The antennæ are pale gray, like the body. The fore wings are gray, due to black scales lying on a pale straw-yellow ground. On the inner fourth of the wing are two yellow spots, one just above, and the other just below, the median vein. In the middle of the wing, just below the costa, is a prominent square, bright straw-yellow spot; on the outer fourth of the wing is a slightly curved yellow band, with three scallops on the outer edge, and extending to a large yellow patch in the middle of the wing, which is tridentate on the outer edge, it is bordered beyond with a black, zigzag line, and a fine, stout, yellowish line beyond. A dusky streak extends from the apex to the costal yellow band. There are two broken dusky lines at the base of the fringe on both wings. The hind wings are yellow, with four sharply zigzag dark gray lines. The under side of the fore wings is paler than above, with a yellowish tinge. The hind wings are pale yellow, with a single, much curved line on the outer third of the wing; and there are two dots near the middle of the wing and a row of blackish dots at the base of the fringe. It expands one inch."

I have not been able to identify this species or see the type.

63. *Botis subolivalis* Pack., Ann. L. N. H. 261, 1873.

Botis hircinalis Grote, Bull. B. S. N. S. ii, 232.

I have examined a number of specimens of this species from Maine and New York. The males do not show the pale sinuate external fascia on primaries above, and the hind wings are not rayed as in the female. All the specimens I have seen from the East have the secondaries above dark and immaculate. This is closely allied to the European *opacalis*.

64. *Botis unifascialis* Pack., *l. c.* 261.

This Californian species differs by having the hind wings above shaded with whitish—in one male almost entirely pale. Beneath, they are paler than in *subolivalis*, and altogether the Californian species so approaches in this and other respects to the European form that it may not be possible to separate them. But one Californian ♀ (Hy. Edwards, No. 207) has the secondaries above entirely blackish, and, except that they are paler beneath, just like my Eastern specimens. It seems to me that these two forms may be united under one specific name. The males have more pointed and apparently longer wings than the females.

65. *Botis niveicilialis* Grote, Bull. B. S. N. S. ii, 232.

New York. This is a very distinct form, with blackish wings and snow-white fringes. It may not be properly placed here. But the entire present arrangement of our species of *Botis* is not insisted upon, and is quite provisional in its character.

66. *Botis stenopteralis* Grote, Can. Ent. x, 26.

I have received this species from Canada (from Mr. Caulfield) and Maine (Professor Fernald). An exceedingly distinct and narrow-winged form, distantly recalling the European *ablutalis*, from which it differs by the darker color, stouter body, narrow, even, exterior line, and black discal mark on primaries above. Fore wings very dark brown, median space sometimes shaded with gray; discal mark black, outer line white, even, slightly rounded. Hind wings with black terminal space, with yellowish and fuscous basal shades and a mesial yellowish or white incomplete band continuous with exterior line on primaries. Wings beneath pale reddish-ochery or whitish with common line and discal marks; external line of both pair fuscous. Palpi black at the sides, whitish beneath. Abdomen blackish above, annulate with white; beneath whitish. Expanse, 18 mil.

EURYCREON *Led.*

1. *Eurycreon chortalis* Grote, Bull. B. S. N. S. 1, 89, pl. 5, fig. 13.

New York; Massachusetts; Oregon (No. 5255, Hy. Edw.); Soda Springs (Behrens).

2. *Eurycreon sticticalis* (Linn.).

Illinois (Dr. Nason). This species is European. Also found in Colorado (Hayden).

3. *Eurycreon cereralis* Zell., Beitr. 1, 517.

New York; Illinois; Denver (Hayden).

4. *Eurycreon anartalis* Grote, Can. Ent. 10, 27.

California (Behrens).

5. *Eurycreon rantalis* (Guen.).

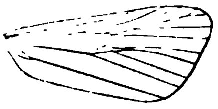
Scopula occidentalis Pack., *l. c.*

Notwithstanding the slight difference in size, the Californian specimens seem to belong to the same species with the Texan, as indicated by Zeller. Two specimens are shaded with pale ocherous, and this circumstance draws against the validity of *communis* as distinct. Lederer's figure of *crinitalis* does not quite agree with *communis*, the line being dentate, but Zeller's *crinitalis* is undoubtedly *communis*. I have a specimen which is leather-brown! I think that *rantalis* and *occidentalis* refer to fuscous forms, and *crinitalis* and *communis* to ocher forms of the same ugly and variable species. Remembering the analogy in *ventralis* and *fracturalis*, such a variation cannot be considered extraordinary. I did not recognize in Lederer's somewhat enlarged figure of *crinitalis* my *communis*, because the line is *dentate*, as in Lederer's figure of *rantalis*. The clypeus is mucronate. The inner line is also apparent in *communis*, wanting in Lederer's figure of *crinitalis*, and thus there is a little doubt whether *crinitalis* and *communis* are the same; but Lederer's doubt that *crinitalis* and *rantalis* were distinct goes to suggest that his *crinitalis* is an extreme variety of the usual ocher form of *rantalis*, and which I have described as *communis*. If these suggestions prove correct, the species will have a wide range; from California to Texas, Alabama, and to Buenos Ayres in South America. It is perhaps one of our most unsightly moths. Although I did not regard them as typical, I described certain yellowish-fuscous specimens, which I would now consider to belong to *rantalis*, as a variety of *communis*.

EPIPASCHIÆ.

Ocelli present. Male antennæ with a basal scaled tegumentary process thrown backward over the thorax; female antennæ simple; clypeus flattened; male maxillary palpi tufted (*Cacozelia*, *Toripalpus*, *Tetralopha*) or scaled (*Epipaschia*, *Mochlocera*). Tongue scaled at base; labial palpi as long as or exceeding the front, with small, pointed, scaled, terminal joint. Fore wings with straight or depressed, in the males of *Tetralopha* somewhat convex, costal margin, pronounced apices, widening outwardly, subtriangulate; 12-veined, or 11-veined (*Tetralopha*), vein 1 simple (*Mochlocera*, *Toripalpus*, *Tetralopha*), or more or less distinctly furcate at base (*Epipaschia*, *Cacozelia*); vein 5 near 4 at base; 8 out of 7 to external margin just below apices; 9 out of 8 and both to costa just before apices; cell incompletely closed. Hind wings 8-veined, three internal veins counted as 1; 4 and 5 near together at base; 8 free; cell incompletely closed except in *Toripalpus*. Female frenulum divided; that of the male simple.

This group is characterized by the flattened clypeus and the tegumentary scaled process attached to the base of the antennæ in the male, and thrown backward over the thorax. It presents some features of Heineman's *Galeriæ*, but vein 1 is not uniformly furcate at base of primaries, and the third joint of the male labial palpi is not naked and excavate. The ocelli are also present. It is probable that *Deuterollyta conspicualis* of Lederer, from Brazil, belongs to this group.



EPIPASCHIA *Clemens*.

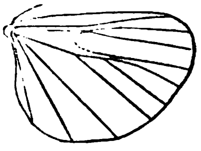


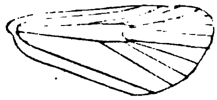
Fig. 1.

Male antennæ with a basal tegumentary scaled process as long as the thorax; ciliate beneath; scaled above; the joints of the antennæ are well defined. Male maxillary palpi scaled. Labial palpi as long as the front, curved upward, with moderate, pointed, scaled, third article not well defined from second. Fore wings with evin 5 joined to 4 by a very short cross-vein; 8 out of 7 about a fourth from the origin of 6; 9 out of 8 a very short furcation; 1 more or less distinctly furcate at base; 5 prolonged inward beyond the point where the closure of the cell is indicated above and below. Hind wings with vein 5 joined to 4 by a very short cross-vein; cell open.

Epipaschia superatalis, fig. 1 (neuration).

Epipaschia superatalis Clemens, Proc. Ac. Nat. Sci. Phil. 14, 1860.
Deuterollyta borealis Grote, Bull. Buff. Soc. Nat. Sci. 1, 177.

♂ ♀. Fore wings dusty yellowish-gray with powdery black lines. Inner middle line marked on costa by a black dot; below it is obsolete, or partially indicated. A black discal dot near the costal spot of the inner line. Outer line irregularly denticulate, better marked superiorly, where it runs obliquely outward to median nervules, produced about vein 4, thence running inwardly below vein 3, whence it descends, very slightly outwardly projected, to internal margin. Terminal field wide; a diffuse, broad, brownish or blackish shade-band marking the veins. A terminal series of distinct interspaceal black marks becoming continuous inferiorly. Fringes pale, interrupted with brown and with a dotted line. Hind wings fuscous, the veins darker marked; a discal dot very near the base and costal border; a terminal distinct line; fringes pale, with a dotted brown line. Beneath yellowish-gray, sometimes suffused with blackish; a common line and discal dots; the terminal shade on fore wings less prominent than above, and here also continued on secondaries. Several specimens examined from Oldtown, Me., Mr. Charles Fish; also one male from Kansas, Prof. Snow, and one female, Long Island, N. Y., July 6. The type of *borealis* was from Cambridge, Mass., Mr. J. C. Merrill. Dr. Clemens's type was from Farmington, Conn., Mr. Edw. Norton. The average expanse of my specimens is about 22 mil.



MOCHLOCERA *Zeller*.

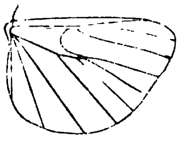


Fig. 2.

Male antennal process as long as the thorax, or nearly so. Male maxillary palpi scaled. Labial palpi a little exceeding the front, curved upward, with the third joint shorter and more distinct than in *Epipaschia*. Neuration of *Epipaschia*, but on primaries vein 1 is simple at base; vein 5 is not inwardly prolonged, and vein 8 is thrown off at about one-third from the origin of 6, a little nearer to the origin of 9, which latter is longer, being here thrown off before the point of its origin in *Epipaschia*.

Mochlocera Zelleri, fig. 2 (neuration).

Mochlocera Zelleri Grote, Can. Ent. 8, 157.

♂ ♀. Fore wings divided into three fields by the median lines.

Inner line defining outwardly the blackish basal space. The line itself is black, with a slight median notch, nearly perpendicular. Median space washed anteriorly with white. A short, black, discal streak. Outer black line very finely denticulate, shaped much as in *superatalis*, but not produced so much on median nervules. It arises at about apical third, at first outwardly oblique, then running inwardly below median vein and narrowing the median space thence to internal margin. Terminally the wing is again black or blackish. A broken black line at the margin. Fringes on both wings dark, pale at base, with broken blackish interline. Beneath blackish, with common shade-band and black discal point on hind wings.

Expanse, 25 mil. Texas, No. 420, collected by Belfrage, April 30. Missouri, collected by Mr. Riley, who informs me the larva lives on *Toxicodendron*.

CAOOZELIA *Grote.*

Male antennæ with the tegumentary process a little exceeding the prothorax. Labial palpi curved upward, exceeding the front a little, concealing in the male the brush-like maxillary palpi, which are much as in *Pempelia*. In the female, the long brush is wanting. The third article of the labial palpi is scaled, pointed, rather short. Fore wings much like *Mochlocera* in the position of 7, 8, and 9, but the cell is nearly closed, and vein 1 is distinctly furcate at base, while veins 4 and 5 intersect. On the hind wings the cell is almost entirely closed, and veins 4 and 5 intersect.

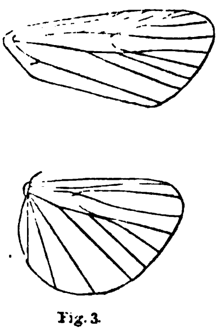


Fig. 3.

Cacozelia basiochrealis, fig. 3 (neuration).

Caoozelia basiochrealis Grote, Proc. Bost. Soc. Nat. Hist. 264, 1877.

♂ ♀. Rusty-ocherous. Interior line double, arcuate, rusty-brown; basal space ochery. A costal dark dot surmounting a faint concolorous-ringed discal mark; median field light stone-gray; median shade visible as a patch of dark, slightly raised scales. Posterior line rusty, double, inclosing a whitish shade, most distinct on costa, of the usual shape. Subterminally the wing is brown, washed with gray on external margin. A fine, terminal, dark line on both wings. Hind wings yellowish-gray, with a fine, denticulate, exterior line. Beneath ocherous; costa at base brown. Head and appendages ocherous; beneath, the fore and middle tibiæ are purplish; hind legs dotted with brown.

Expanse, 18 mil. Two specimens, No. 618, July 17, collected in Texas by Belfrage.

In the colors of primaries, this species recalls *Chalcoela aurifera*, or *Chalcoela Robinsonii*.

TORIPALPUS *Grote.*

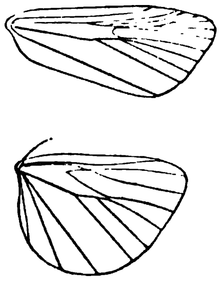


Fig. 4

Male antennæ with a short, tegumentary, scaled, basal process not exceeding the collar; the antennæ are lengthily ciliate beneath. Labial palpi much exceeding the front, the second article elongate, inwardly hollowed out, apparently to receive the maxillary palpi, which are bi-tufted, as in *Tetralopha.* Third article of labial palpi short. Fore wings with vein 1 simple, the cell almost closed, 5 from the cross-vein close to 4, 8 out of 7 at more than one-third from the origin of 6; 9 out of 8, a rather long furcation. Hind wings with the cell closed; 4 and 5 joined; 5, a continuation of the discal vein; 6 and 7 from one point; 8 free.

Toripalpus breviornatalis, fig. 4 (neuration).

Toripalpus breviornatalis Grote, Proc. B. S. N. H. 265, 1877.

♂. Two specimens: one, the type, perfectly fresh, collected by Belfrage in Texas (No. 421), April 5, the other, larger, from Colorado, sent me by Dr. Bailey, in broken condition, belong to this species, characterized by the antennal appendages being extremely short, hardly exceeding the collar. The labial palpi are longer, and the antennæ are much more lengthily ciliate compared with *Mochlocera.* The ornamentation, but not the color, is like *Zelleri.* Fore wings reddish-brown at base to the inner line, which is dark brown, preceded by a dark shade with raised scales, slightly outwardly produced on costa and submedially. Inner portion of median space washed with white on costal region and anteriorly. A discal dot. The outer line is dark brown, denticulate, produced over median nervules, whence it runs obliquely inwardly to internal margin. It is followed by a whitish corresponding shade-line. Terminal space washed with brown, becoming whitish before the margin. The outer line is situated much nearer the outer margin than in *Zelleri.* A terminal dotted line distinct on hind wings. These latter are pale fuscous, with an outer dentate line followed by a white shade more or less noticeable. Terminal palpal joint marked with black, tipped with pale. Head and appendages reddish-brown; thorax becoming pale behind. Beneath, the wings are reddish-brown, becoming paler inferiorly. A common exterior line near the margin, and corresponding with the exterior lines on upper surface in shape. Fringes pale, obsoletely interlined. On hind wings beneath, a discal point. The Texan specimen expands 24 mil. The male from Colorado nearly 30 mil.

TETRALOPHA *Zeller* (1848).

Ocelli present. Labial palpi exceeding the front; in the male, the second joint is elongated, and furnished with a sheath-like depression on the inside, in which the bi-tufted maxillary palpi are concealed. Male antennæ with a short, scaled, basal process. Fore wings 11-veined; in the male, there is a costal fold beneath at base, furnished with a fringe of transverse scales; the subcostal nervules are crowded, so that their exact disposition is a matter of uncertainty. There is a vitreous spot toward the base of the cell, just beyond the interior line. The cell is open, and narrower than in the female. The female wing is destitute of the vitreous spot, the fold, and fringe. Veins 4 and 5 intersect, and the cell is partially closed from both sides. Veins 8 out of 7, 9 out of 8. Hind wings 8-veined; 8 out of 7; 4 and 5 joined on one stem; cell closed. The fore wings are broad, with rounded or convex costæ in both sexes.

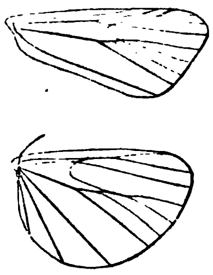


Fig. 5. ♀

Dr. Clemens describes the *third* palpal joint as being very long, and concealing the maxillary tufts. But I see that it is plainly the *second* in a new Texan species, of which I here illustrate the venation of the female wings. In *platanella* and *asperatella*, the *third* joint of the labial palpi is difficult to make out; but I believe it more likely to be small, as is usual, than that the males of these two species should make an exception to the general palpal structure in the family. In both males and females of *asperatella*, I believe to make out the third joint distinctly; it seems longer in the latter.

Professor Zeller describes three species, *militella*, Isis, 1848, p. 880, *robustella*, Isis, p. 881, and *melanogrammos*, Verh. Zool.-Bot. Ver. p. 546, tab. iii, fig. 24 *a*, *b*, 1872.

Dr. Clemens redescribes the genus under the name of *Lanthaphe*, and states erroneously that it appears to be congeneric with *Acrobasis* of Zeller. The genus is very close to *Toripalpus*, but clearly distinguished by the 11-veined primaries and the shape and fold of the male wings.

Tetralopha militella Zeller, Isis, 1848, p. 880.

"Rückenschild und Kopf graugelblich, Schulterdecken und Kragen an der Basis dunkler. Der hintere, übergelegte Schopf ist röthlich-gelb und hat fast Augenlänge. Fühler ziemlich lang, an dem doppelt gefranzten Theil etwas dicker, auf dem Rücken bleichgelb und bräunlich schwach geringelt. Die Gesichtsschuppen liegen locker auf. Die reichhaarigen Pinsel der Maxillar-Taster sind schwarz-bräunlich, der Stiel weisslich. Lippentaster gelblich-grau. Beim ♀ ist das Endglied ⅔ so lang als das zweite Glied, dünn und feinspitzig. Beine hellgrau, an der Mittel- und Hinterschiene auf dem Rücken nahe der Basis mit einem schwachen Haarbüschchen. Hinterleib bleichgelb, an den Segmentwurzeln hellbraun.—Vorderflügel ♂, 3''', ♀ 5''' lang, nach hinten beträchtlich erweitert, mit sehr convexem Vorderrande, schwach convexem Hinterrande und deutlichem Vorderwinkel; röthlichgrau, am Anfang des

Mittelfeldes mehr weisslich-grau. Das verdunkelte, beim ♀ mehr braune Wurzelfeld hat in einiger Entfernung von der Wurzel eine fast vollständige Binde röthlich-brauner, an den Enden brauner, aufgerichteter Schuppen. Die Grenze des Wurzelfeldes bildet vor der Flügelhälfte eine ziemlich steile und fast grade, braune, weiss-grau ausgefüllte Doppellinie. Beim ♂ wird sie nahe am Vorderrande durch eine schmale spindelförmige Längsgrube durchbrochen, die nahe der Basis anfängt und vielleicht die Mittelzelle vorstellt, über und unter ihrem Ende liegen noch braune und graue aufgerichtete Schuppen. Die zweite Querlinie liegt weit vom Hinterrande entfernt, fast in der Mitte zwischen diesem und der ersten Querlinie; sie ist verloschen, grau, gebogen, schwachwellig, am oberen Drittel mit einer kurzen, nach aussen gerichteten Ecke; sie ist einwärts von einer braunen Schattenlinie eingefasst; zwischen ihr und der schwarz punktirten Hinterrand-Linie ist die Farbe hellröthlichbraun, schattig. Franzen heller.

"Die abgerundeten Hinterflügel sind grau-bräunlich, hell gefranzt. Medianader mit den Verhältnissen 3:1—1:3.—Unterseite gelbbräunlichgrau, hell, beim ♂ in einem langen, breiten Streifen am Vorderrande von der Wurzel aus mit langen, quergehenden hellen Schuppen dicht bekleidet."

I have a single male specimen from New York agreeing with this description.

Tetralopha robustella Zeller, Isis, 1848, p. 881.

"Der vorigen etwas ähnlich, mit gestreckteren Vorderflügeln, brauneren und durch keine Doppellinie beendigtem Wurzelfelde. Grösse über der von Militella. Rückenschild, Beine und Kopftheile bräunlich-grau, dunkler bestäubt. Hinterleib hell mit dunklerer Basis der Segmente und solchem Afterbusch. Vorderflügel 5½‴ lang, erheblich gestreckter als bei Militella, mit weniger convexem Vorderrande. Wurzelfeld dunkelbraun, an der Basis heller; hinter seiner Mitte zwischen Subdorsal- und Subcostalader mit zwei schräg über einander stehenden Schuppenhöckern; es endigt vor der Flügelmitte scharf in einer sehr schwach gekrümmten, gegen aussen concaven Linie, welche durch den daran stossenden weissgrauen Grund des Mittelfeldes sehr gehoben wird. Am Vorderrande tritt die braune Farbe etwas über diese Linie hinaus und endigt an einem weissgrauen Schuppenhöcker, der einen braunen Punkt hat. Unterhalb desselben mehr nach hinten in geröthetem Grunde steht ein anderer Höcker, an den sich oberwärts kleinere in einer gegen den Vorderrand gerichteten Reihe anschliessen. Hinter ihr ist der ganze Grund bis zum Hinterrand hellbraun; die zweite Querlinie bildet einen grösseren Winkel als bei Militella und wird einwärts von einer schärferen dunkelbraunen Schattenlinie gerandet als auswärts; sie ist dem Hinterrande näher als bei der genannten Art. Hinterrands-Linie schwarzbraun, durch die Adern unterbrochen. Franzen bräunlich-grau.

"Hinterflügel hell gelbgrau, grau franzig. Unterseite aller Flügel braungrau mit dunklerer Randlinie."

Tetralopha platanella.

Lanthaphe platanella Clem., Proc. Ac. N. S. Phil. 207, 1862.

"Labial palpi pale brownish-red, touched in front with pale gray. Head and thorax brownish-red, the latter varied with grayish and dark fuscous. Fore wings grayish-fuscous, with the costa touched with brownish-red, and a patch of the same hue in the female, near the base of the inner margin containing a tuft of raised scales; in the male, blackish-brown, touched with brownish-red. The base of the wing is whitish. In the middle of the wing is a broad white band, obsolete toward the costa, with two straight blackish-brown lines internally, and in the male shaded internally with the same hue. The subterminal line is irregular and whitish, dark-margined internally. The hinder margin of the wing is touched with blackish-brown. Hind wings pale brown, somewhat darker toward the hinder margin. The larva is tortriciform in appearance. Head pale brown, mottled with whitish. Body with isolated hairs, pale green, with a dark brown dorsal line and a fainter stigmatal line of the same hue, or pale reddish, with a brown dorsal line on each side of the vascular. It makes a web on the under surface of the leaf of Sycamore (*Platanus occidentalis*), drawing it together and living within a silken tube. The cocoon is woven on the surface of the ground, in form of a flattened oval, consisting of brown silk covered exteriorly with grains of earth. The larvæ remain in it unchanged during the winter. It may be taken in July, and enters the pupa state during the latter part of August, to appear as an imago in May or June."

This species is probably equivalent to *melitella* of Zeller.

Tetralopha asperatella.

Lanthaphe asperatella Clem., Proc. Acad. Nat. Sci. Phila. 207, 1860.

"Labial palpi blackish-brown, varied with whitish. Thorax pale grayish, varied with grayish or dark gray. Fore wings dark brownish-gray, with a blackish-brown tuft of scales in the basal part of the fold, and a smaller one of the same hue on the disk above it, a whitish median band, sometimes almost obsolete, containing on the disk a small blackish-brown tuft in the female, with an internal crenated blackish line, and shaded toward the base with blackish; on its external margin is a line of raised scales. The subterminal line is pale grayish, angulated and margined internally by a blackish line, and externally by a fainter one produced into points on the nervules. The hinder marginal line is black. Sometimes in the female base of the wing is whitish, slightly touched with luteous."

I have five specimens—two males and three females—before me. The smallest measures 23 mil., the largest 28. They vary in the amount of grayish-white on the median space of fore wings above.

The localities are Texas, Long Island (N. Y.), Montreal, Massachusetts. It is uncertain that they belong here.

In addition, Belfrage has collected in Bosque County, Texas, a number of specimens which agree closely in ornamentation, but are separable into distinct forms by their differing size. Under the circumstance that I am yet without positive identification of certain described species, these forms should not be described at the present writing.

In my opinion, the variability of the species of this genus will be found so great as to prevent accurate determinations until very large material is accumulated.

PHYCIDÆ.

Ocelli sometimes wanting. Male antennæ often with a peculiar structure of the basal portion. This is sometimes bent, with a scale-tuft (*Nephopteryx*, *Pempelia*) or without a scale-tuft (*Anerastia*), or, again, slightly bent, somewhat rigidly held, with a succession of small overlapping scale-tufts (*Pinipestis*); again, there is a basal constriction (*Homeosoma*); again, these peculiarities are wanting (*Ephestia*). The maxillary palpi in the male are sometimes furnished with a concealed pencil of hair (*Pempelia*, *Salebria*); again, they are small, scaled, and similar in the sexes (*Nephopteryx*, etc.); again, they are wanting. Tongue scaled at base. Labial palpi similar in both sexes, scaled, ascending. Fore wings usually narrow; hind wings broad, exceeded by the slender abdomen. The clypeus is full, rounded. Eyes naked. Fore wings 11-, 10-, or 9-veined; vein 1 not furcate; 8 out of 7 (*Nephopteryx*, etc.), or these two veins fall together (*Homeosoma*). Generic characters are offered by the differing position of 4 and 5, which have sometimes separate origin, and again are furcate. The hind wings are 8-, 7-, or 6-veined, the three internal veins counting as one. Generic characters are offered by the differing position of veins 4 and 5, veins 7 and 8, and the point of origin of vein 2. The female frenulum seems to be simple. I do not find this character mentioned by authors, and it may not prove invariable.

The larvæ live in fruit, under bark, or in cases on the leaves. Many pupate on or in the ground; others, like *Pinipestis*, in the thickened sap or under the bark of the tree. Among this group are some of the most dangerous foes to timber. In Europe, the pines are attacked by *Dioryctria abietella* and *splendidella;* in the United States, the ravages of *Pinipestis zimmermani* on the same genus of trees have been noticed in many places, and I have accounts of what I suppose to be injuries inflicted to pineries by *P.? abietivorella* from two or three correspondents in New England.

ACROBASIS *Zeller.*

The male antennæ have a pointed scale-tuft on the basal joint. In *rubrifasciella*, the male antennæ are bent above the tuft, ciliate beneath. Maxillary palpi small; labial palpi pointed, curved upward. Fore wings with 11 veins; 4 and 5 from one point; hind wings with 8 veins; the cross vein nearly complete; 4 and 5 together at the extremity of submedian vein; 8 running close to 7, but free.

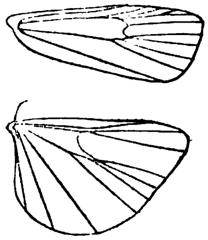


Fig. 6.

Acrobasis rubrifasciella, fig. 6 (neuration).

Acrobasis rubrifasciella Pack., Ann. Lyc. N. Hist. 267, 1873.

♂ ♀. Shining brownish-fuscous, shaded with gray at base on costal region over the superposed dark discal points obliquely downward over median space anteriorly. A ridge of dark, raised scales precedes a blood-red band before the dark, somewhat arcuate, anterior line. Posterior line dark, followed by a faint whitish shade inwardly oblique and straight to median fold, running outwardly, and denticulate over m. nervules. Hind wings dark fuscous. Head and thorax brownish-fuscous. Beneath paler fuscous, without markings. Average expansion 21 mil.

I have examined between fifty and sixty specimens from Maine and Massachusetts, which vary but little; the red band is apt to become faint, especially in worn individuals, but I can always detect it. Some have the tegulæ reddish. The species distantly resembles the European *advenella*.

"In one additional specimen from Maine, the fore wing has scattered reddish scales at base and beyond the middle, while the dark transverse stripe is wanting, and the red portion forms a broad, transverse, bright red band. The larva lives in June and early in July between the leaves of the alder, where it makes a horn-shaped case of black cylindrical pellets of excrements, arranged regularly in circles, the additions being made around the mouth of the case. The case is about an inch and a half long; its mouth a quarter of an inch in diameter. Within, it is densely lined with white silk. The pupa is of the usual color, mahogany-brown, the end of the abdomen rounded, with six hairs projecting from a transverse supraanal projecting ridge. On each abdominal segment is a dorsal, dusky, transverse stripe, widest on the basal segment. The Museum of the Peabody Academy of Science also contains ten specimens of this moth reared by Mr. T. H. Emerton. The larvæ were found feeding on the Sweet Fern (*Comptonia asplenifolia* Ait.), July 7, 1866, at Hamilton, Mass., the moth appearing July 20. The case is quite different in form from that previously described, being regularly oval cylindrical; .55 inch long and .35 inch in diameter. It is constructed in the same manner as those found on the alder. This striking difference in the form of the case may possibly be due to the difference in the form of the leaves of the food-plant, the large broad leaves of the alder inducing the larva to build a horn-like, much elongated case; while the narrow smaller leaves of the Sweet Fern may have led to the formation of a short oval case. The differences are such as we would ordinarily regard as specific, but neither do the pupæ or adults reared from the two plants differ appreciably."—*Packard, l. c.*

Acrobasis tricolorella, n. s.

♂. Fore wings blackish, shaded with whitish-gray on terminal space outwardly, on costal region, over the fused discal points, and on basal space. A broad white band before the anterior line. Below median vein, this band is edged outwardly by a dusky shade-line, and this is followed by a yellow-red shade before the outwardly oblique black anterior line. Outer line followed by a whitish shade, roundedly indented below costa, followed by the blackish ground-color in terminal space, and this by the whitish-gray terminal shading. A dotted, terminal, black line; fringes pale. Secondaries pale fuscous, with paler fringes. Beneath, fore wings dark; hind wings shining pale fuscous. Expanse, 20 mil. Two male specimens collected by Mr. Charles Fish, Oldtown, Me. I have not been able to examine the neuration, but the antennal structure leaves no doubt of the genus.

The genus *Acrobasis* is treated by Heineman as a subdivision of *Myelois*.

PEMPELIA *Hübn.*

Fore wings 11-veined; 4 and 5 from a short stalk. Hind wings 8-veined; 4 and 5 from a common stalk beyond the extremity of the cell, and appearing as the continuation of the cross-vein. The median vein throws off 2 and 3; the stalk of 4 and 5 runs near 3, but only touches it at a single point, sweeping by it, and becoming the concave cross-vein which on the upper side returns to form a prolongation to vein 6. In *Acrobasis rubrifasciella*, 3, 4, and 5 are exceedingly close at base; the cross-vein vanishes centrally; here it is completely indicated. Neuration of hind wings resembling *Catastia*.

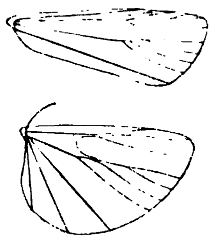


Fig. 8

The male antennæ are bent at base with a scale-ridge. The maxillary palpi are concealed by the ascending labial palpi, and terminate in a tuft of testaceous hair. In the female, this tuft is wanting, and the antennæ are simple.

This form differs from *Pempelia* as defined by Heineman by the hind wings being 8-veined, and in that 4 and 5 of the primaries spring from a common stalk; from *Salebria* also by the latter character.

Pempelia pravella, n. s., fig. 8 (neuration).

♂♀. Blackish and gray, resembling *Acrobasis rubrifasciella* in ornamentation. Base of primaries whitish-gray; no raised scales. Anterior line blackish, diffuse, consisting of two outwardly oblique, slightly waved lines, usually coalesced, but allowing sometimes the narrow gray space between them to be seen. Median field gray; two superposed black dots on cell; outer line whitish, finely dentate, with a little deeper submedian notch, margined on both sides by a blackish shade. A row of terminal black dots; fringes gray. Hind wings testaceous-fuscous, rather pale, with pale fringes. Beneath, the hind wings are yellowish; fore wings fuscous, with the exterior line marked. Abdomen testaceous-fuscous; thorax and head dark grayish. Legs gray, marked outwardly with black. Expanse, 19 to 20 mil. Eighteen specimens examined, taken by Mr. Charles Fish, of Oldtown, Me.; also by Professor Fernald at Orono.

This species so nearly resembles *rubrifasciella* at first glance that it might be considered an extreme variety, although strongly generically distinct. It is not so smoothly scaled, and the tone is grayish, not brownish-fuscous.

SALEBRIA *Zeller*.

Fore wings 11-veined, with veins 4 and 5 separate. Hind wings with 8 veins, 2 near the lower angle of the cell. Male antennæ bent at base, with a scale-ridge. Maxillary palpi in the male ending in a pencil of discolorous hair hid behind the labial palpi.

The distinction from *Pempelia* proper consists in the 8-veined secondaries. In the North American specimens here described, vein 5 runs alongside and touching 4 at base; 4 leaving 5 at a point about midway between the cell and external margin.

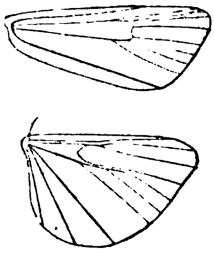


Fig. 7.

Salebria fusca, Haw., fig. 7 (neuration).

♂ ♀. Fore wings blackish-gray, with black discal mark formed of the usual dots united. Inner line white, black-margined on either side, upright, once dentate on vein 1, absorbed superiorly by the black shade-lines. Outer line white, distinct, continuous, black-margined on either side, indented subcostally and again before internal margin, slightly uneven. Head and thorax blackish. Fringes very narrowly interlined on both wings. Hind wings as usual, smoky translucent, with narrow terminal line. Beneath without markings, except on costa of primaries. I have examined 15 females and 4 males from Oldtown, Me., sent me by Mr. Charles Fish, and Orono, by Professor Fernald. Identified by Professor Zeller as the same as the European species.

NEPHOPTERYX *Zeller*.

The male antennæ are bent at base, where they are provided with a scale-ridge. The male maxillary palpi are small, concealed, not provided with a pencil of hair, as in *Pempelia* and *Salebria*. The fore wings are 11-veined; the hind wings 8-veined. In *ovalis*, as herewith figured, and *fenestrella*, veins 4 and 5 have a separate origin on primaries;

the hind wings have 4 and 5 from a common stalk, connected by a short vein with 3, sweeping by and forming the cross-vein.

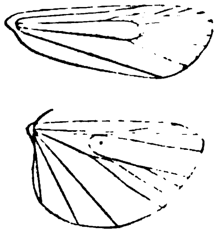


Fig. 9.

Until the structure of our species can be carefully compared with the European, it will be better to refer to this genus all forms which combine the peculiarity of the male antennæ here described with untufted male maxillary palpi, and 11-veined primaries, on which 4 and 5 have a separate origin, and 8-veined secondaries. There is no doubt that Dr. Packard has incorrectly used the term "*Pempelia*" throughout, and probably also the present generic term. His *Nephopteryx roseatella* does not belong here. Dr. Packard's generic determination of the female of *ovalis* carries no weight; for, in this genus and its allies, the female does not possess the essential characteristics.

Nephopteryx ovalis.

♂ *Pempelia ovalis* Pack., Ann. Lyc. N. Hist. 269, 1873.
♀ *Nephopteryx latifasciatella* Pack., *l. c.*

♂ ♀. I have Dr. Packard's types before me and forty or fifty additional specimens. There is not a particle of doubt that Dr. Packard has described the sexes under distinct genera, and thus taken the sexual characters as generic, although the male has no characters of *Pempelia* except the bent and tufted antennæ. The two specimens, and descriptions for that matter, are otherwise almost exactly the same. The female described by Dr. Packard wants the ochery submedian streak, which, where it cuts the dark band before the anterior line, usually expands into a more or less well-marked spot. In some specimens of either sex, this ocherous mark is almost wanting. My material has been mostly sent me from Maine by Mr. Fish and Professor Fernald.

"Palpi large and broad, antennæ tufted at base as usual, fore wings oblong, not very long, outer edge less oblique than usual. Body and fore wings ash, being covered with whitish and brown scales. Fore wings with a short, curved, dark line at base on the median vein. On inner third of wing a very broad brown band, directed obliquely outward from the costa to the inner edge, and enclosing a large distinct, regularly oval (longitudinal), ochreous spot between the median and submedian veins. Two obscure black discal points situated as usual; the outer one is enclosed in a dusky shade crossing the wing obliquely and limited beyond by the usual submarginal zigzag line, this line is curved inward below the costa; from the middle of the wing to the inner margin it is exactly parallel to the outer edge, terminating in an angle directed outwards. Between this line and the edge is a series of dusky bars, the interspaces cinereous. A marginal black line. Fringe cinereous. Hind wings pale smoky. Beneath fore wings dusky. A whitish costal spot near the apex, but no line. Hind wings slightly paler. Abdomen concolorous with the hind wings. Legs dull ash, ringed with whitish."—*Packard*, *l. c.*

The submedian and median veins are flecked with white on the median space in the darker specimens. The ovate ocher spot on the submedian fold in the fuscous shade-band before the anterior line is variable in distinctness.

Nephopteryx fenestrella.

Pempelia fenestrella Pack., Ann. N. Y. Lyc. 259, 1873.

"In this species the fore wings are long and rather narrower than in the European *P. palumbella*, and the large broad palpi, though of much the same form, are porrected instead of ascending; but in venation and the structure of the antennæ it agrees with the European species, and *Pempelia ovalis* from New England, in which the wings are much shorter. Body and wings cinereous or granite-gray, the abdomen and legs being paler, and concolorous with the legs and hind wings, which are of the usual glistening hue of the genus. Fore wings of the same ash hue as the thorax, speckled with black scales. Two black dots at the base of the wing below the median vein. Beyond on the submedian vein is a longitudinal, blackish, inconspicuous stripe edged on each with dull ochreous. Above it is a dark point on the median and subcostal veins, with whitish scales surrounding the middle dot, but there are no raised scales on the wing. Just beyond the middle of the wing are two, prominent, squarish, black spots, one on the median, the other on the subcostal vein. A distinct, white, submarginal line, parallel with the outer edge and bordered internally with black scales, especially marked on the costa. The space between this line and the outer edge is filled in with deep, ochreous, longitudinal bars, alternating with black streaks, of which the costal one is the widest and shortest. These bars do not quite reach the distinct, black line at the edge. Fringe ash, twice lineated with whitish. Beneath a pale, whitish, straight, submarginal line, edged within towards the costa with dark ash.

"Length of body ♂, .45, ♀, .45 of an inch; fore wing ♂, .43, ♀, .44 of an inch. California (Edwards)."—*Packard*, *l. c.*

I have examined the type and two additional specimens, and the neuration, which latter should agree with *Pempelia*, as stated by Packard. The difference between *Nephopteryx* and *Pempelia* does not lie in the neuration, but in the structure of the male maxillary palpi.

Nephopteryx leoninella.

Pempelia leoninella Pack., Ann. N. Y. Lyc. 259, 1873.

"Antennæ and palpi as in *P. fenestrella*, but the fore wings are more produced towards the apex, the outer edge being more oblique. Body and base of fore wings tawny, the thorax being clay-yellow; palpi clear ash. Basal third of fore wings tawny yellow, somewhat orange-colored externally, outer edge of this colored portion directed regularly, obliquely outwards from the costa to the inner edge, with three, black, venular dots along this oblique border. In the ash space beyond is a distinct, dark, discal dot, and the veins are black. A broad, marginal, tawny, yellow band, the sides even and parallel. The costa, however, is cinereous to the apex. A marginal black line, and a fine dark line in the cinereous fringe near the base. Hind wings of the usual hue. Abdomen luteous. Beneath, fore wings smoky, dusky towards the costa; a pale, costal streak, not forming a submarginal pale line as in *P. fenestrella*. Legs dark ashen, whitish at ends of joints.

"Length of body, ♂, .50, ♀, .45 of an inch; of fore wing, ♂, .46, ♀, .45 of an inch. California (Edwards)."—*Packard, l. c.*

I have examined the type (in bad condition) and three unset but fresh specimens. The discal points are present, not absent, as Packard states. This species agrees closely in form with *fenestrella*, but differs by the ochery color of the basal and marginal fields of the primaries.

I give here, for convenience of the student, two unrecognized descriptions in this genus, by the late Dr. Clemens, in Proc. Acad. Nat. Sci. Phila. p. 205, 1860. It must be confessed that Dr. Clemens's descriptions in this group omit so many essential characters that it is doubtful if the species he intends can be identified with certainty.

"*N. ? ulmi-arrosorella.*—Female. Grayish-fuscous. Fore wings with a slender, dark fuscous angulated line, edged on the costa internally by a pale grayish spot, and on the inner margin externally by another of the same hue. The subterminal line pale gray, dark margined internally. Hind wings pale brownish, darker on the margin.

"The larva is found on the American Elm in August. The head is pale brown, dotted with dark brown. The body dark green, with a dorsal, double line of pale green patches, and a slight subdorsal and stigmatal line of the same hue. On the 1st, 2d, 4th, 5th and 10th rings, are brown subdorsal points. It weaves a web on the surface of the leaves, feeding beneath it. The pupa is contained in a web between united leaves, in the vivarium. It becomes a pupa about the middle of August, and an imago about twelve or fourteen days after transformation."

"*N. undulatella.*—Labial palpi, head and thorax grayish fuscous. Fore wings grayish fuscous, with an angulated white line crossing the disk, sometimes obsolete above the fold, margined with dark brownish, and a subterminal line of the same hue dark margined on both sides. At the end of the disk is a short blackish transverse line, slightly margined exteriorly with whitish. Hinder margin tipped with blackish, cilia grayish fuscous. Hind wings grayish testaceous; cilia paler.

"Penna., Canada and Mass. From Dr. Charles Girard, Washington, D. C.

"Early in October, I found pupæ of this insect at Niagara Falls, on the Canada side, under shelter of loosened portions of the bark of the American Elm. They were enclosed in a cocoon of silk, mixed with particles of bark. On the same tree I took a number of larvæ which were descending the trunk to undergo pupation. I did not, however, obtain imagos from any of the specimens. The body was nearly uniform in diameter, with the ordinary number of feet. Head as broad as the body and dark green. Body dark green, between the segments yellowish and dotted with yellow; first rings with two black dots on the sides."—*Proc. Acad. Nat. Sci. Phila.* 1860, p. 205.

PINIPESTIS *Grote.*

Head with a transverse thick ridge of scales behind; frontal scales forming a projecting bunch. Maxillary palpi alike in both sexes, concealed by the porrect labial palpi, which exceed the front. Ocelli. Male antennæ thicker than in the female, with the joints not apparent, very slightly bent at base, where they show a ridge of thin tuftlets of scales, pubescent beneath. Fore wings 11-veined, with veins 4 and 5 running close together at base, but having a separate origin. Hind wings 8-veined, vein 5 running close to 4, but independent, and continuous with the cross-vein.

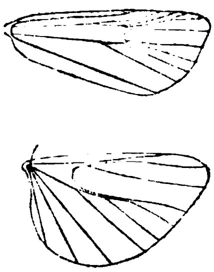


Fig. 10.

Pinipestis Zimmermani, fig. 10 (neuration).

Pinipestis Zimmermani, Grote, Can. Ent. 9, 161 (*Nephopteryx.*)

♂ ♀. Blackish-gray, shaded with reddish on the basal and terminal fields of the fore wings. There are patches or lines of raised scales on the basal field and on the anterior and darker portion of the median space behind the transverse line; also the exterior line and discal mark are accompanied by raised scales. Median lines prominent, consisting of double black lines enclosing pale bands. The inner line at basal third is perpendicular, dentate. The outer line at apical fourth is once more strongly indented below costa. The median field is blackish, becoming pale outwardly; it shows a pale, sometimes whitish, discal spot, surmounted by raised scales. The terminal edge of the wing is again pale or ruddy before the terminal black line. Fringes blackish. Hind wings pale yellowish-white, translucent, shaded with fuscous on costal region, and more or less so terminally, before the terminal blackish line; fringes dusky. Beneath, the fore wings are blackish, marked with pale on costa; hind wings as on upper surface. Body blackish gray, with often a reddish cast on thorax above and on the vertex. Abdomen gray, annulated with dirty white; legs dotted. Expanse, 26–30 mil.

The species varies in the amount of reddish on the basal and terminal fields; the raised scales are easily lost in handling the living specimens.

The *larva* is found in the Middle States, New York and Pennsylvania, in June and July, beneath the bark of the Red Pine and the White Pine (*Pinus resinosa* and *P. strobus*); also on the Scotch, Russian, and Austrian imported pines. The wounds occur on the main stem, usually below the insertion of the branch. On cutting into the bark beneath the exuding pitch, the larva may be found, which measures about 18 millimetres when full-grown. The head is shining chestnut-brown, with black mandibles. The body is livid or blackish-green, naked, with series of black dots, each giving rise to a single bristle. The prothoracic shield is blackish. The larva has three pair of thoracic or true-jointed feet and four abdominal or false feet, besides anal claspers. This larva, eating on the inner side of the bark, and making furrows in the wood, causes the bleeding, which, when the depletion is excessive or continuous, and especially in the case of young trees, has proved fatal. In July, the worm spins a whitish, thin, papery cocoon in the mass of exuded pitch, which seems to act as a protection to both the larva and chrysalis. The *pupa* is cylindrical, smooth, narrow, blackish-brown, about 16 millimetres in length. The head is pointed, there being a pronounced clypeal protuberance; the segments are unarmed; the anal plate is provided with a row of four spines, and two others, more slender, on either side of the mesial line, below the first. It gives the moth in ten to fourteen days.

Pinipestis Zimmermani seems to be one of the most destructive of Lepidopterous insects to timber. I have seen a number of young pine-trees killed by it. It is an American form, and differs structurally from the European *Dioryctria abictella* by the peculiarities of the male antennæ and the different position of veins 6 and 7 with regard to the cross-vein on primaries.

It is not certain how the hibernation of *P. Zimmermani* is accomplished. From the fact that Mr. Zimmerman has found larva resembling those of this species in the clots formed by the exuding pitch in January, it may be that the species winters in the larval state, and that it is single-brooded. The identification of these winter larvæ is not complete. In color they were more pinkish than the specimens taken in June, and (but this might be expected) smaller in size. Again, whether the larva feeds on the gum or not is uncertain, though certain of the facts observed point to this conclusion.

For an opportunity of examing specimens of *Dioryctria abietella*, I am indebted to Mr. Charles D. Zimmerman. The joints of the antennæ are distinct, so as to give a serrated appearance to these organs. The European species is much smaller and less brightly colored than Zimmerman's Pine Pest, and wants notably the patches of raised scales on the wings, on which I have dwelt in my original description, and which are so distinctive of *Zimmermani*. There cannot remain the faintest doubt of the distinctness of Zimmerman's Pine Pest from the European *abietella*. The probable difference in the clypeal structure of the pupa and the differing habit of the larva of *Zimmermani*, as compared with the characters given by Ratzburg of *abietella*, I have alluded to in my original paper on the subject.

But on examining the neuration of *abietella* I find that on the fore wings veins 4 and 5 are not furcate, but spring, as in *Zimmermani* and the species I here refer to *Nephopteryx*, separately from the median vein, running so close together at base that they appear to be furcate at their point of divarication. I also find that the origin of 6 and 7 is different from *Zimmermani* and the species I here refer to *Nephopteryx*. In *abietella*, 6 joins 7 at the point of issue of the discal cross-vein; in *Zimmermani*, 6 joins 7 before the cross-vein, which arises from 6. On the hind wings in *Pinipestis*, vein 5 is independent; but, in *Dioryctria abietella*, vein 5 is joined to the median vein close to the point of origin of 4 and 3. I find thus that Heineman's diagnosis of *Dioryctria* is correct, except that, if by "Ast 4 und 5 auf gemeinschaftlichem Stiele" he means that 4 and 5 are furcate, as I have understood him, he has made the same error that I did at first in considering these veins furcate in *Zimmermani*.

Pinipestis? abietivorella, n. s.

Under the MS. name of *Pempelia abietivorella*, Dr. Packard sends me a single fresh female specimen, which bears at first sight a close resemblance to the European *abietella*, but agrees in neuration with *Pinipestis*. Vein 5 of the hind wings is independent; veins 4 and 5 of the primaries are not furcate, and the position of the cross-vein is as in *Zimmermani*. But as I do not know the male of this new Pine Pest, I cannot surely indicate its generic position. It may belong to *Salebria*. The moth has so close a resemblance to *abietella* that I took it for that species until I examined the neuration. It seems a little larger, the primaries more blackish, powdered with white. There are no raised scales on the fore wings and no red tints, so that it cannot be confounded with *Zimmermani*. The anterior line is more dentate and the posterior line broader than in *abietella*. The moth was received by Dr. Packard from Prof. H. W. Parker, of Amherst, Mass. The larva was found two-thirds grown, "boring in top of a tree of the Norway Spruce It was smooth, slender, dark brown. Taken the first week of August. Full grown it measured ¾ inch, and pupated in cocoon formed of its own excrement and silk the last of August. The imago was found fresh and alive Sept. 10." This Norway Spruce moth must not be confounded with *Salebria fusca*, which it very nearly resembles. The fore wings are more powdered with white, the posterior line broader, while in *fusca* vein 6 on fore wings is thrown off from the cross-vein further from 7. This new moth cannot be a *Pempelia* from the 8-veined secondaries, nor can I refer it as congeneric with the species I here refer to *Nephopteryx* from the position of vein 5 of the hind wings. *Salebria fusca* is apparently a larger moth than *abietivorella*, and may be most quickly distinguished by the discal points being black, superposed, and sometimes coalesced, while in *Pinipestis? abietivorella* and the European *Dioryctria abietella* the discal mark of primaries is white.

HONORA, *n. g.*

The ocelli are prominent. Male antennæ without peculiarity, pubescent beneath. Labial palpi not very long, porrect, thickly scaled, the rather long and stout third article concealed by the vestiture. Maxillary palpi small, scaled. Fore wings narrow and long, 11-veined, 4 and 5 furcate; hind wings 7-veined, 5 wanting, 3 and 4 furcate on a long stem just before the margin; 6 continuous with the discal cross-vein on the upper corner of the cell; 8 out of 7, a short furcation; 2 out of the lower angle of the cell, which is closed.

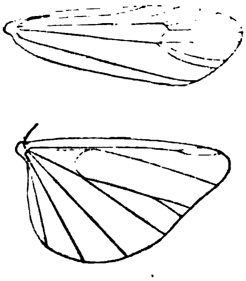


Fig. 11.

This genus seems to me to fall in with Section C of *Stenoptycha*, according to Heineman, but I have not the European *oblitella* to compare. The differences between these sections seem to me as important as those considered by Heineman of generic value in the group.

Honora mellinella, n. s., fig. 11 (neuration).

♂ ♀. Fore wings blackish-fuscous, with a pale, undefined, costal shading. Interior line white. A yellow shade-spot beyond the line on internal margin. Two separate, very small, dark, discal dots. Exterior line near the margin, even, narrow, and indistinct white. Base of the wing yellowish. Anterior line not continued to costa. Hind wings very pale fuscous, silky, with concolorous fringes. Head and thorax faded ocherous. Three specimens (Texas, Belfrage, No. 443). The expanse varies from 15 to 19 mil. I sent this species to Prof. Zeller, under the number 376, but received no determination of the species.

DAKRUMA, *n. g.*

Ocelli small. Male antennæ very slightly bent at base, where they show a little thicker coating of scales. Labial palpi rather short, with the terminal joint subequal. Maxillary palpi scaled, small in both sexes. Wings rather long and narrow. Fore wings with 11 veins, the cell closed by a fold; 4 and 5 furcate from a single stem; 8 out of 7. Hind wings 7-veined; cell closed by a fold; the subcostal vein joined to the costal by a short branch beyond the closure of the cell; 8 out of 7, a very short furcation before apices; 3 and 4 furcate just beyond the cross-vein.

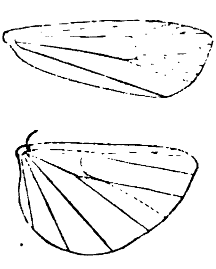


Fig. 12.

This genus differs from *Homeosoma* by the 11-veined primaries and the absence of the suprabasal constriction of the male antennæ; on the hind wings, veins 3 and 4 furcate beyond the cell.

Dakruma turbatella, fig. 12 (neuration).

♂ ♀. Whitish-gray. Cell striped with white. Inner line thick, blackish. A black discal upright streak. Outer line double, blackish, with ad, white, included space, oblique, a little uneven, twice more prominently toothed, somewhat diffuse. Veins finely marked. Terminal minute dark dots. Fringes fuscous-gray. Hind wings very pale fuscous, with paler interlined fringes. Beneath fuscous-gray. Body whitish beneath, above fuscous-gray. One male from Illinois (Dr. Nason) has the outer line narrower, more acutely bidentate, and perhaps is a different species; it appears otherwise to agree with the typical male. This species expands 25 mil. The hind wings seem a little paler and more pointed in the male. The Illinois specimen was captured May 26. I have examined three females and one male taken by Mr. Charles Fish at Oldtown, Me.

HOMEOSOMA *Curtis.*

The male antennæ are suddenly constricted above the base. Labial palpi porrect; maxillary palpi small, scaled. Fore wings with 10 veins; 4 and 5 from a rather long stem; vein 8 wanting. Hind wings with 7 veins; veins 3 and 4 have a separate origin out of the lower angle of the cell; 8 out of 7, a very short furcation before apices.

The hind wings differ from those of *Dakruma* by the origin of veins 3 and 4, which is a separate one; vein 4 from the cross-vein close to 3, whereas in *Dakruma* 3 and 4 are furcate beyond the closure of the cell.

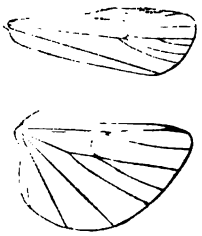


Fig. 13.

Homeosoma stypticella, fig. 13 (neuration).

♂ ♀. Dusty whitish-gray; wings narrow; a diffuse, blackish, anterior line; discal spot formed of two, blackish, superposed or coalesced dots near the outer line, which is even, oblique, bordered on either side by a blackish shade, the outer of which sometimes wanting and indicated by a costal mark. Hind wings smoky-pellucid, with paler fringes. Beneath smoky, immaculate. Average expanse, 19 mil.

Three males and ten females examined. Maine, Massachusetts, New York (Lewis County), W. W. Hill. There are probably similar species not yet described, and attention must be paid to the generic characters. Several females in my collection indicate such species, much like *stypticella* in appearance, but probably generically distinct, a fact which cannot be easily established without reference to the male sex.

It somewhat resembles the figure 17 on Plate 2 of the Missouri Reports as that of *Pempelia grossulariæ* Packard; but *stypticella* wants the double band forming the anterior line. It does not agree with the figure on page 140, because the outer line wants the submedian tooth there shown, and the wings are narrower. I regret not to have identified as yet this species of Dr. Packard's, which is probably incorrectly generically referred, and of which no structural characters of value are given by Mr. Riley.

ANERASTIA *Hübn.*

Male antennæ a little bent at base, without scale-tuft, ciliate beneath, the joints conspicuous. Ocelli wanting. Labial palpi long, porrected.

Fore wings 10-veined; median vein 3-branched, a single vein representing 4 and 5. Hind wings with 7 veins; 3 and 4 furcate on a long stem; 2 before the lower angle of the cell. Tongue present.

Anerastia hæmatica Zell., fig. 14 (neuration).

Anerastia hæmatica Zell., Verh. Zool.-Bot. Ver. p. 555, 1872.
Nephopteryx roseatella Pack., Ann. N. Y. Lyc. N. H. 270, 1873.

♂ ♀. Head and thorax dull yellow, more or less stained with rosy-brown. Fore wings with a pale yellow costal stripe running to a point and expiring before the tips; else the silky primaries are dull roseate, shading to fuscous below the stripe and fading to yellowish at internal margin. Hind wings very pale yellowish-fuscous. Fringes on both wings yellowish; beneath silky yellowish-fuscous. The species expands 17 to 19 mil. I have examined four specimens of both sexes, including Dr. Packard's type. Maine, Massachusetts. Whether the maxillary palpi are present, I have not yet been able to decide.

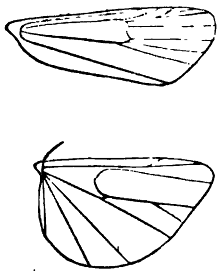


Fig. 14.

There is no doubt on my mind, after examining Packard's type, that it is the same species previously described by Zeller. It appears that Zeller has recognized a second closely allied species from a specimen sent him by Packard, which differs from *hæmatica* by the thinner, longer, labial palpi, with a brown stripe from the 2d joint outwardly to the tip. The costal stripe is said to be powdered rather thickly with brown. Packard's type does not show any brown powdering, and I cannot recognize any palpal stripe. The palpi are stained with purplish. I do not think it is likely that these characters are specific. My other specimens show a variation in size and distinctness of the reddish tinge on primaries, but I cannot see either the character pointed out by Zeller or any others on which to infer two species.

Of this species, Dr. Packard says in the body of his description:—"It has all the structural characters of *Nephopteryx*." But in his remarks upon it a little lower down he says:—"Though the antennæ are without the usual tuft of scales, and the palpi are longer than usual, I should judge that it was a *Nephopteryx*." It is, however, as I have above explained, abundantly distinct from *Nephopteryx* in structure.

It is quite necessary that the structure in this group should be fully reported in describing species. I am prevented from identifying *Pempelia Hammondi* with certainty, because the characters of the maxillary palpi and venation are not given by Mr. Riley. In the absence of an examination of the generic characters in this group, any opinion on the validity of "modern genera" must, I think, be without value.

The following is a provisional list of our species:—

PHYCIDÆ.

ACROBASIS *Zell.*

exulella *Zell.*
rubrifasciella *Pack.*
tricolorella *Grote.*
indiginella *Zell.*
Phycita nebulo Walsh.
var. juglandis *Le Baron.*

SALEBRIA *Zell.*

fusca *Haw.*

PEMPELIA Zell.

pravella *Grote.*
lignosella *Zell.*
incautella *Zell.*
petrella *Zell.*
? tartarella *Zell.*
? virgatella *Clem.*
? subcæsiella *Clem.*
? Hammondi *Riley.*
? grossulariæ *Pack.*

NEPHOPTERYX *Zell.*

ovalis.
♂ *Pempelia ovalis* Pack.
♀ *N. latifasciella* Pack.
fenestrella.
Pempelia fen. Pack.
leoninella.
Pempelia leon. Pack.
? basilaris *Zell.*
consobrinella *Zell.*
? undulatella *Clem.*
? ulmi-arrosorella *Clem.*
? Edmandsii *Pack.*

PINIPESTIS *Grote.*

Zimmermani *Grote.*
? abietivorella *Pack.*

ZOPHODIA *Hübn.*

Bollii *Zell.*
dentata *Grote.*

MYELOIS *Zell.*

albiplagiatella *Pack.*

HONORA *Grote.*

mellinella *Grote.*

EPISCHNIA *Hübn.*

farrella *Curtis.*

ANERASTIA *Hübn.*

hæmatica *Zell.*
Nephop. roseatella Pack.
tetradella *Zell.*
glareosella *Zell.*
binotella *Zell.*

EPHESTIA *Guen.*

elutella *Hübn.*
ostrinella *Clem.*
interpunctella *Hübn.*
Zeæ Fitch.
ochrifrontella *Zell.*
hospitella *Zell.*

SPECIES DESCRIBED.

Prorasea simalis.
Aedis funalis.
Stemmatophora nicalis.
Asopia devialis.
    squamealis.
Arta statalis.
    olivalis.
Melanomma auricinctaria.
Scoparia libella.
Emprepes nuchalis.
Botis albiceralis.
    plumbicostalis.
    anticostalis.
    syringicola.
    talis.
    stenopteralis.
Epipaschia superatalis.
Mochlocera Zelleri
Cacozelia basiochrealis.
Toripalpus breviornatalis.
Tetralopha asperatella.
    platanella.
    militella.
    robustella.
Acrobasis rubrifasciella.
    tricolorella.
Pempelia pravella.
Salebria fusca.
Nephopteryx ovalis.
    fenestrella.
    leoninella.
    undulatella.
    ? ulmi-arrosorella.
Pinipestis Zimmermani.
    ? abietivorella.
Honora mellinella.
Dakruma turbatella.
Homeosoma stypticella.
Anerastia hæmatica.

ART. XXVIII.—PALEONTOLOGICAL PAPERS NO. 6: DESCRIPTIONS OF NEW SPECIES OF INVERTEBRATE FOSSILS FROM THE LARAMIE GROUP.

BY C. A. WHITE, M. D.

The fossils described in this paper were collected by the writer (unless otherwise stated in connection with the description) from the strata of the Laramie Group, during the season of 1877, in Colorado, Wyoming, and Utah. Many other associated species were also collected, but only the hitherto undescribed forms are noticed in this paper.

Of the numerous invertebrate forms hitherto collected from the strata of this great group, except some insect remains (to be described by Mr. S. H. Scudder), and a few unstudied Ostracoid Crustaceans, all are molluscan.

CONCHIFERA.

Genus VOLSELLA Scopoli.

Subgenus BRACHYDONTES Swainson.

Volsella (Brachydontes) regularis (n. sp.).

Shell arcuate-subovate in marginal outline; valves moderately convex; upper margin more or less strongly arched from beak to rear; thence with a continuous but stronger curve to the postero-basal margin, which is somewhat abruptly rounded to the gently concave base; front moderately narrow, slightly projecting beyond the beaks, and abruptly rounded to the base; beaks depressed, scarcely perceptible as such, and nearly but not quite terminal; hinge-margin short, nearly straight; umbonal slope somewhat prominent, but conspicuous only by increasing the apparent concavity of the basal part of the shell. Surface marked by numerous, rather coarse, radiating lines, or small costæ, which increase in size toward the free margins of the shell. These costæ have generally a somewhat crenulated aspect, due in part to small sinuosities in their course, and in part to being frequently crossed by lines and undulations of growth; denticles or crenulations of the short front margin distinct.

Length of the type-specimen 36 millimeters; breadth at the widest part 18 millimeters; but several less perfect examples obtained at different localities indicate a much larger size, the largest of which must have had a length of 6½ centimeters.

Position and locality.—Laramie Group. The type-specimen is from the Valley of Crow Creek, Northern Colorado, 15 miles above the confluence of that creek with South Platte River. Other examples are from Cañon Park, Valley of Yampa River; Danforth Hills, near White River Indian agency, Colorado; and Rock Springs Station, Union Pacific Railroad, Wyoming.

Volsella (*Brachydontes*) *laticostata* (sp. nov.).

Shell transversely elongate, arcuate-subelliptical; upper border broadly and almost regularly arched; posterior border somewhat abruptly but continuously rounded from the upper border to the base, which latter border is gently concave along its middle portion; front abruptly rounded, beaks inconspicuous, situated near the front; hinge-line short, nearly straight, not forming an angle with the remainder of the upper border; denticles, or crenulations of the anterior border, distinct. Surface marked by the usual distinct lines of growth, and also by fine radiating costæ, which are obsolete along the whole length of the median portion of the shell, and are more distinct upon and near the dorsal border than elsewhere.

Length 5 centimeters; greatest width 10 millimeters.

This species differs conspicuously from the preceding one, which is from the same formation, in its greater proportionate length, the straighter and less crenulate character of its costæ, and their absence or obsolescence upon the median portion of the shell.

Position and locality.—Laramie Group, about 400 feet from its base; Danforth Hills, near White River Indian agency, Colorado.

Genus NUCULANA Link.

Nuculana inclara (sp. nov.).

Shell small, elongate-subovate in marginal outline, gradually narrowing behind the beaks. Beaks not prominent, situated about one-third of the full length of the shell from the front; valves only moderately convex, even in the anterior and umbonal regions, and without distinct umbonal ridges. Basal margin broadly semi-elliptical; anterior margin regularly rounded from the cardinal margin to the base; postero-basal margin sloping upward to the posterior margin, which is sharply rounded to the cardinal margin; the latter margin slightly arched, or the anterior and posterior portions of it forming a very slight angle with each other; denticles minute, numerous, 12 to 15 or more in front of the beak and a greater number behind it.

The few examples discovered being only casts, the true character of the surface is not known, but it appears to have been marked with only the usual concentric lines of growth. Character of the pallial line unknown.

Length 11 millimeters; height from base to beaks 5 millimeters. No examples larger than this were discovered, but it is possible that those obtained are under full adult size.

Position and locality.—Laramie Group, about 400 feet above its base; Danforth Hills, near White River Indian agency, Northwestern Colorado.

Genus ANODONTA Cuvier.

Anodonta parallela (sp. nov.).

Shell transversely much elongate, oblong or semi-elliptical in marginal outline; valves gently convex, apparently a little more so near the front than elsewhere; beaks situated about two-sevenths the length of the shell from the front, depressed, the elevation of the umbonal region being hardly perceptible; hinge-line long; the whole dorsal border nearly straight; both anterior and posterior borders regularly rounded; that of the posterior being a little more abruptly rounded than the front; base nearly straight, or very slightly emarginate along or a little in front of the middle. Test thin; surface smooth or marked only by the ordinary lines of growth and one or two faint ridges running from the beaks to the postero-dorsal margin.

Length 62 millimeters; breadth 20 millimeters.

The extraordinary length of this shell compared with its width is an unusual feature in this genus; but all the other characteristics of the species, so far as they can be observed on the specimens yet discovered, indicate it to be a true *Anodonta*, and its immediate associates are also all fresh-water shells. Only two examples have been discovered, both imperfect; but together they show all the essential characteristics of the species. Notwithstanding its unusually elongate form, the character of the test and its edentate hinge apparently leave no doubt as to its generic character as here indicated.

Position and locality.—Laramie Group; Valley of Crow Creek, Northern Colorado, about 10 miles above the confluence of the creek with South Platte River.

Genus UNIO Retzius.

Unio goniambonatus (sp. nov.).

Shell of medium size, transversely elongated, subtrihedral in marginal outline, being rapidly narrowed posteriorly from the anterior portion; moderately gibbous, most so a little in front of its mid-length and above its mid-height; test somewhat thick; beaks placed near the anterior end, moderately depressed; umbones slightly raised above the hinge-line; umbonal ridge distinct, angular, and so prominent as to produce a flattened or even slightly concave space between it and the hinge-margin, giving the whole back of the shell a broadly flattened aspect; front margin regularly rounded from beneath the beaks to the basal margin, which latter margin is nearly straight or only slightly convex, especially behind the anterior third of its length; postero-basal margin narrowly rounded to the postero-dorsal margin, which meets the former with an elongated downward and backward slope from the hinge-margin; the latter margin nearly straight, and occupying about two-thirds the whole length of the shell. Surface marked by only the ordinary lines and coarser imbrications of growth, but usually the angular umbonal ridge is cut across by three or four short, distinct ridges and corresponding furrows, extending obliquely inward and backward, being scarcely perceptible in front of the umbonal ridge, and becoming obsolete before reaching the postero-dorsal margin, or at least only producing slight sinuosities upon it.

Length 58 millimeters; height from base to umbones 34 millimeters; thickness 28 millimeters.

The elongate subtriangular outline, prominent and angular umbonal ridges, and broad, flattened dorsum of this species, are features that readily separate it from all other known forms, and, together with the seven other species associated with it (mentioned in the next description), show an extent and diversity of differentiation among these earlier species of *Unionidæ* that is hardly surpassed at the present day.

Locality and position.—Upper part of the Laramie Group; Black Buttes Station, Union Pacific Railroad, Wyoming.

Unio aldrichi (sp. nov.).

Shell of medium size, transversely elongate, approximately oblong in marginal outline, a little higher posteriorly than anteriorly; moderately gibbous, especially along the umbonal ridge, where the shell is thickest; test moderately thick, becoming much so in old shells; beaks placed nearly one-third the length of the shell from the front margin, incurved, broad, but not very prominent, although the flattened umbo is raised above the level of the hinge-line; umbonal ridge prominent, subangular; postero-dorsal portion of the shell behind this ridge compressed, sometimes subalate; front portion of the shell moderately gibbous, and between this and the umbonal ridge the sides are distinctly flattened; anterior margin regularly, but somewhat narrowly, rounded down to the basal margin, which is nearly straight along the middle; postero-basal margin somewhat narrowly rounded, and extended upward and backward to the postero-dorsal margin; the latter margin sometimes truncated obliquely downward and backward, and sometimes so rounded as to give a more nearly square truncation to the posterior end of the shell; hinge-line long and straight. Surface marked only by the ordinary lines of growth, except all that portion which lies behind the umbonal ridge. This portion is marked by numerous sharply-raised, irregular lines or narrow ridges, with the intervening spaces wider than the ridges themselves, which, beginning almost imperceptibly just behind the umbonal ridge, extend backward with a greater or less upward curve to the dorsal and posterior borders. These raised ridges increase in number with the growth of the shell, in very small part by implantation, but mainly by bifurcation. They usually constitute a conspicuous surface-feature of the shell, but in some examples they are more or less obsolete. Their character is similar to that of the markings upon *U. senectus* and *U. primævus* White, especially the latter.

Length of the largest discovered example 82 millimeters; height at mid-length 48 millimeters; thickness about 32 millimeters.

The specific name is given in honor of Mr. Charles Aldrich, formerly a member of the Survey.

Position and locality.—Upper part of the Laramie Group, Black Buttes Station, Union Pacific Railroad, Wyoming, where it is found associated with *U. brachyopisthus*, *U. couesi*, *U. endlichi*, *U. propheticus*, *U. primævus*, *U. holmesianus*, *U. goniambonatus* White, and apparently with one or two other species of this genus.

Genus CORBICULA Mergele.

Corbicula cleburni (sp. nov.).

Shell large, subtrihedral in marginal outline; height from base to umbo equal to the extreme transverse length, moderately gibbous and its sides regularly convex, flattened or a little concave along the postero-dorsal portion, concave in front, where there is an almost defined lunule; test thick, or even somewhat massive in the case of old shells; dorsal line forming a somewhat regular convex curve from the beak to the postero-basal portion, which latter portion is abruptly, sometimes almost angularly, rounded to the base; basal margin almost regularly rounded up to the antero-cardinal margin, but its convexity is usually a little greatest in front of the mid-length; antero-cardinal margin straight or slightly concave, meeting the antero-basal margin at an obtuse angle or a prominent abrupt curve; beaks prominent, elevated, curving inward and forward, and ending in a well-defined point when well preserved, as most of the examples are; lateral teeth strong, well developed, and finely crenulate; cardinal teeth well developed, the outer posterior one in one example showing faint crenulations, but otherwise of the ordinary character; pallial line distinct, somewhat distant from the margin; sinus small, directed strongly upward. Surface marked only by the usual lines and undulations of growth.

Height of the largest example 42 millimeters; extreme transverse length about the same; thickness 32 millimeters.

This species bears more resemblance to *C. cytheriformis* M. & H. than to any other published species; but it may be distinguished from that species by its more distinctly trihedral outline, its greater proportionate height, and its concave, almost lunulate front.

Position and locality.—Laramie Group, Crow Creek, Colorado, about 12 miles north of its confluence with South Platte River.

Corbicula cardiniæformis (sp. nov.).

Shell somewhat above medium size for a species of this genus, transversely subelliptical, moderately gibbous, especially a little forward of and above the middle, but somewhat compressed toward the free margins, especially in the posterior region; front and posterior margins narrowly and the basal broadly rounded, forming together a nearly true semi-ellipse; cardinal margin broadly rounded and sloping gently downward from the beaks to the posterior margin; antero-dorsal margin slightly concave just forward of the beaks, where the shell is also slightly concave; umbonal portion of each valve prominent; beaks narrowed, distinctly defined, not much elevated, but pointing strongly forward and incurved. Hinge and interior markings unknown.

Length from front to rear 59 millimeters; height from base to beaks 38 millimeters; greatest thickness, both valves together, 28 millimeters.

In outward appearance, this species seems to occupy an intermediate position between the usual short forms of *Corbicula* and that section of the genus which was separated by the late Mr. Meek under the subgeneric name of *Leptesthes*. It differs, however, from any species of that section known to me in the narrowness and distinct definition of the beaks; the umbonal region being broad and the beaks depressed and illy defined in all the published species of *Leptesthes*.

With the exception of the differences named, and which seem to be correlated subgeneric differences, the shell here described resembles in general aspect some of the shorter varieties of *Corbicula* (*Leptesthes*) *fracta* Meek. For a more general comparison, however, it so nearly resembles some species of *Cardinia* as to have suggested the specific name which is here applied to it.

Position and locality.—Laramie Group, Valley of Crow Creek, 15 miles above its confluence with Platte River, Northern Colorado.

Corbicula obesa (sp. nov.).

Shell small or not above the average size for species of this genus, inflated; sides somewhat regularly convex, suboval, or subtrihedral in marginal outline; transverse length somewhat greater than the height; basal margin almost regularly rounded, meeting both the posterior and anterior margins by regular and nearly equal curves; postero-dorsal portion regularly rounded from the beaks to the posterior margin; antero-cardinal margin straight, but the shell has a concave appearance in front on account of the slight forward prominence of the beaks; postero-cardinal margin very little, if any, depressed below the adjacent portions of the shell; beaks small, pointed, not prominent, but directed a little forward, and placed only a little in advance of the mid-length; lateral teeth well developed, but slender, and apparently not crenulate, but the condition of the examples in hand was not conclusive upon this point; cardinal teeth well developed, but not robust; pallial sinus small. Surface marked only by the usual lines of growth, and these being mostly very fine, the surface has a comparatively smooth, or sometimes even a polished aspect in well-preserved examples.

Transverse length of a medium-sized specimen 30 millimeters; height from base to beak 26 millimeters; thickness 20 millimeters.

This species differs too materially from any known described species to need detailed comparison.

Position and locality.—Laramie Group Valley of Crow Creek, Colorado, 15 miles north of its confluence with South Platte River.

Subgenus LEPTESTHES Meek.

Corbicula (*Leptesthes*) *macropistha* (sp. nov.).

Shell small, longitudinally subelliptical or subovate, broader (higher) posteriorly than anteriorly, slightly gibbous or somewhat compressed; test strong but not massive; basal margin broadly convex, posterior margin truncating the shell, and its direction being upward and a little backward, and abruptly rounded to both the postero-cardinal and basal margins; postero-cardinal margin broadly convex; antero-cardinal margin nearly straight and directed obliquely downward and forward to the front, which is abruptly rounded to the base; beaks depressed, not well defined, and not projecting above the hinge-line, placed about one-third the length of the shell from the front. Surface showing the usual lines and imbrications of growth, and well-preserved examples show that the former were so fine as to give an almost polished aspect to the surface. Lateral teeth well developed and finely crenulate, cardinal teeth well developed, and having the usual characters of the genus; pallial line somewhat distant from the margin; sinus shallow.

Length of an average-sized example, among the typical examples of the collection, 21 millimeters; height 15 millimeters; thickness, both valves together, 10 millimeters.

There are two or three examples in the collection, that were obtained from layers separated by only a few feet, that are considerably larger than the above dimensions, but these, having some other modifications of form, are referred to this species with doubt.

This shell evidently belongs to the section designated as *Leptesthes* by Meek. Among other peculiarities of this section, internal casts of it show a distinct but shallow and somewhat broad furrow, extending downward and forward from the hinge-margin behind the beaks to about the middle of the shell; and the inner surface of the valves show the corresponding ridge. This, in this species at least, is really not so much a true ridge as it is a sudden thinning of the shell, along a nearly vertical line, in its posterior half.

The peculiar flattening of the umbonal and upper middle portions of the shell, its greater width, and equal if not greater thickness behind than in front, are characters by which the species may be readily recognized.

Position and locality.—Laramie Group, Crow Creek, Northern Colorado, 15 miles above its confluence with the South Platte River.

Genus ACELLA Haldeman.

Acella haldemani (sp. nov.).

Shell very small and very slender; spire longer than the aperture; volutions about six and very obliquely coiled, slightly convex; last one not ventricose; aperture only slightly, if at all, expanded, its outer margin, as shown by the lines of growth, being nearly parallel with the axis of the shell. Surface marked by numerous lines of growth parallel with the border of the aperture and nearly parallel with the axis of the shell. These, owing to the minute size of the shell, are distinguishable only under a lens of considerable power.

Length 6 millimeters; diameter of last volution 1½ millimeters.

The specific name is given in honor of Prof. S. S. Haldeman, the author of the genus.

Position and locality.—Laramie Group, Valley of Bear River, near the confluence of Sulphur Creek, Wyoming.

Genus PHYSA Draparnaud.

Physa felix (sp. nov.).

Shell large; body-volution inflated, shouldered at the distal side, which is somewhat abruptly rounded from the outer side and near the suture, at nearly right angles with the axis of the shell; spire comparatively small, and appears to have been only moderately elevated. Surface marked by the usual lines of growth, except that of the whole shouldered portion from the suture outward, which is marked by numerous small, obliquely triangular papillæ, which are arranged in oblique rows that coincide nearly with the lines of growth.

The full length of the body-volution was not less than 38 millimeters.

Only two fragments of this remarkable *Physa* have been discovered, but the characters shown by them, as recorded above, are sufficient to distinguish it from any other species, and when more perfect examples are found it may show different generic characters also.

Position and locality.—Laramie Group, Crow Creek, Colorado, 10 miles above its confluence with the Platte.

Genus HELIX Linnæus.

Helix evanstonensis (sp. nov.).

Shell small, subglobose, wider than high; spire somewhat prominent, its sides convex, terminating in a moderately acute apex; volutions about six, convex; last one a little inflated and regularly rounded from the suture to the center of the base; suture distinct; umbilicus closed with a callus; base flattened in the middle, scarcely depressed; aperture oblique; outer lip reflected. Surface marked by numerous very distinct raised lines of growth parallel with the outer lip.

Height 6½ millimeters; breadth of last volution 9 millimeters.

Genus NERITINA Lamarck.

Neritina naticiformis (sp. nov.).

Shell small, subglobose in aspect, being more nearly like that of *Natica* than the usual forms of *Neritina*, due mainly to the greater elevation of the apex, consisting of three or four volutions, which so rapidly increase in size that the last one comprises much the greater part of the bulk of the shell; all the volutions regularly convex, the suture being distinct; test not massive; aperture large, nearly straight on the inner side, and regularly convex on all other sides, the whole comprising more than a semicircle; edge of the outer lip thin; inner lip moderately broad, flattened, apparently smooth, sloping strongly inward, or away from the outer lip; inner margin of the inner lip somewhat concave, apparently without crenulations.

Surface marked by numerous distinct lines of growth, and upon some examples traces of revolving striæ have been detected, especially upon the proximal or lower portion.

Extreme length from apex to front margin 6 millimeters; greatest diameter of the last volution, across the middle of the aperture, about the same.

In general aspect, this little shell so closely resembles a *Natica* that, the apertures all being filled with the imbedding material, the first suggestion that it might not belong to that or a closely allied genus came from its association with fresh- and brackish-water forms. Upon breaking up some of the examples, the inner lip was found to be more characteristic of *Neritina* than *Natica*, although it is not so broad and characteristically developed as is usual in the former genus. In this respect, and in the moderately thin test, it departs from typical forms of *Neritina*.

Position and locality.—Laramie Group, Bear River Valley, near the mouth of Sulphur Creek, Wyoming.

Subgenus VELATELLA Meek.

Neritina (*Velatella*) *baptista* (sp. nov.).

Shell small, elliptical in outline, broadly convex above, the convexity of the postero-median portion being greater than elsewhere, nearly flat beneath; umbo prominent, nucleus or apex posterior, minutely subspiral and only a little elevated above the posterior margin, small, closely incurved, and turned to the right side; inner lip broad, smooth, slightly convex in all directions, and occupying fully one-half of the under surface of the shell; outer lip apparently moderately thin, but this feature has not been clearly seen.

Surface so nearly smooth as to give the shell an almost polished appearance, but under the lens minute striæ of growth are visible, and also especially near the borders minute radiating striæ are seen, apparently in the substance of the shell. In addition to this, there are, upon the only example discovered, seven or eight irregular radiating stripes of coloration of the shell. These are now brownish in color, while the general surface is buff; both doubtless different from those that characterized the shell while living, but no doubt correctly representing them in shape, relative position, and contrast.

Length 10 millimeters; breadth 7 millimeters; height 5 millimeters.

This species resembles in many respects the *N.* (*V.*) *patelliformis* Meek, especially the variety *weberensis* White, but it differs from the former in form, and from the latter in being without any trace of radiating, raised lines or costæ, in the greater prominence of the umbonal portion, and its more conspicuous apex. Its coloration is not taken into account, as its preservation is deemed only accidental.

Position and locality.—Laramie Group, Black Buttes Station, Union Pacific Railroad, Wyoming.

Genus GONIOBASIS Lea.

Goniobasis endlichi (sp. nov.).

Shell moderately elongate-conical; spire with straight or slightly concave sides; volutions six or seven, much and nearly regularly convex, the last one slightly inflated; suture well defined, and appearing unusually deep on account of the convexity of the volutions; aperture ovate, its distal end angular, its front somewhat narrowly rounded, and without a sinus; outer lip apparently sharp; inner lip with a thin reflected callus, more developed toward the front; columella gently arcuate.

Surface marked by fine but distinct lines of growth, which are crossed by very numerous, fine, revolving, raised lines, giving it a cancellated appearance under the lens. In addition to these, there are usually from four to six much larger, nearly equidistant, revolving, raised lines of nearly equal size, visible upon the volutions of the spire, and ten or twelve of the same upon the body-volution. These larger, revolving, raised lines are sometimes absent or obsolete, but the smaller markings are always present.

Length about 22 millimeters; diameter of body-volution 11 millimeters.

This species is evidently nearly related to *G. nebrascensis* and *G. tenuicarinatus* M. & H., and should perhaps be referred to *Pachycheilus* Lea, but the difficulty of learning the exact character of the lip leaves that matter in some doubt.

Specific name given in honor of Dr. F. M. Endlich.

Position and locality.—Laramie Group, 7 miles west of Evanston, Wyo., near the boundary line between Wyoming and Utah.

Genus VIVIPARUS Lamarck.

Viviparus prudentia (sp. nov.).

Shell depressed-subconical; spire short; volutions five and a half or six, including the minute ones of the apex, convex; last one considerably enlarged, composing much the greater part of the shell, almost or quite regularly rounded from the suture to the umbilicus; suture well defined, and rendered still more conspicuous by the convexity of the volutions; umbilicus very small and deep; aperture short, subovate or subcircular, obtusely angular at its distal side; a little straightened by contact with the next volution between that angle and the umbilicus, and elsewhere almost regularly rounded.

Surface smooth, almost polished, but marked by very fine lines of growth.

Length from front to apex 18 millimeters; breadth of body-volution 18 millimeters.

This shell is proportionally shorter than any other species of the genus known to me, but it seems to possess all the characteristics of *Viviparus.* Its outer lip has the usual straight margin, but its umbilicus is a little more open than usual, and the inner lip not reflexed, but almost continuous in its curvature with the outer lip.

Position and locality.—Laramie Group, Crow Creek, Colorado, 10 miles above its confluence with South Platte River, Northern Colorado.

Viviparus couesi (sp. nov.).

Shell very large when fully adult; volutions six or seven, convex, the distal side of the last one especially rounded abruptly in to the suture, giving it a somewhat shouldered aspect there, while the outer side is broadly convex and sloping gently forward and inward; suture deeply impressed, the apparent depth being increased by the great convexity of the volutions. Surface marked by the ordinary lines of growth, no revolving marks of any kind being detected. The lines of growth indicate that the margin of the outer lip was nearly straight, as is usual with species of this genus, and which character distinguishes it from *Campeloma.* Inner lip thickened, and reflexed at the proximal or anterior end, but not covering the umbilical fissure there, which is moderately large. The precise shape of the aperture is unknown, but it is probably ovate.

No entirely perfect examples have been discovered, but the largest one yet obtained would, if perfect, measure about 65 millimeters in length; full width of body-volution 38 millimeters.

This species is described by Meek in vol. iv, p. 181, pl. 17, fig. 15, King's United States Geological Survey of the Fortieth Parallel, and referred to the genus *Campeloma*, but not specifically named. The numerous specimens, however, that have been obtained from the typical and other localities show that the species possesses the true characters of *Viviparus.*

This species is distinguished from all others of the genus known to me in American strata by its great size, and there are few other species with which it is in any danger of being confounded. From *V. paludinæformis* Hall, it differs in its more robust form, in the greater convexity of its volutions and the abrupt rounding of their distal side, and in the presence of a comparatively large umbilical fissure.

Position and locality.—Laramie Group, Valley of Bear River, seven miles northwestward from Evanston, Wyoming, and at several points in the vicinity of Mellis Station, Union Pacific Railroad, near the confluence of Sulphur Creek and Bear River. It is associated with *Campeloma macrospira* Meek, *Unio vetustus* Meek, and other fresh-water mollusks, as well as many brackish-water species.

Genus ODONTOBASIS Meek.

Odontobasis ? formosa (sp. nov.).

Shell rather small; spire equal to about one-half its entire length; volutions about six, the body one inflated and the distal ones moderately convex, the distal part of each somewhat shouldered, and marked there by numerous small longitudinal folds that become obsolete toward the proximal part; these longitudinal folds are less distinct upon the body-volution than upon the distal ones; upon the latter also there is a small revolving furrow near to, and upon the distal side of the suture, giving those volutions a slightly constricted aspect, but which constriction does not extend upon the body-volution.

Surface apparently marked only by lines of growth, with the exceptions already mentioned, and some revolving ridges or lines upon the proximal side of the body-volution, near the beak.

Length 12 millimeters; breadth of body-volution 7 millimeters.

Only one specimen of this species has been discovered, and this is a somewhat distorted cast from the reddish shales of the Laramie Group near its base. Neither the aperture nor the extremity of the beak is shown in the specimen, and I am not entirely satisfied that it belongs to the genus *Odontobasis*, but its general aspect and observable characters favor that reference, although it bears considerable resemblance to *Admetopsis* Meek, from the Cretaceous strata at Coalville, Utah. Perhaps a sufficient reason for referring this shell provisionally to *Odontobasis* is the fact that a species of that genus is already known in the Laramie Group, while no other genus is yet known there to which it could be confidently referred. Of the three other species of *Odontobasis* yet known, two are from the Fort Pierre Cretaceous Group, a true marine formation, and one from the Laramie Group, near Point of Rocks Station, Union Pacific Railroad, Wyoming, a brackish-water formation, and which is there associated with *Goniobasis insculpta* as well as *Ostrea* and *Anomia*. The genus *Admetopsis* is not yet known to exist in the Laramie Group, nor unassociated with true marine forms.

When other specimens shall have been discovered, it may prove that the description should be somewhat modified, but it is doubtless quite sufficient for the identification of the species.

As a rule, the molluscan remains of the Laramie Group indicate a brackish condition of the waters in which they lived. This species is associated with *Melania wyomingensis* Meek, which is necessarily regarded as a fresh-water shell, and is often found associated with other fresh-water forms, and also with *Nuculana*, which is now known only in marine waters. Its other associates are *Corbula*, *Corbicula*, and *Anomia*.

Position and locality.—Laramie Group, about 400 feet above its base, Danforth Hills, Northwestern Colorado. The locality is about 10 miles northeastward from White River Indian agency.

ART. XXIX.—PALEONTOLOGICAL PAPERS NO. 7: ON THE DISTRIBUTION OF MOLLUSCAN SPECIES IN THE LARAMIE GROUP.

BY C. A. WHITE, M. D.

The term Laramie Group is here used to include all the strata between the Fox Hills Group of the Cretaceous period beneath, and the Wasatch Group (=Vermilion Creek Group of King) of the Tertiary period above. That is, it includes, as either subordinate groups or regional divisions, both the Judith River and Fort Union series of the Upper Missouri River; the Lignitic series east of the Rocky Mountains in Colorado; the Bitter Creek series of Southern Wyoming and the adjacent parts of Colorada; and also the "Bear River Estuary Beds", together with the Evanston Coal series, of the Valley of Bear River and adjacent parts of Utah. Strata of this great Laramie Group are known to exist in other large and widely separated districts of the western portion of the national domain, but only those above indicated are especially noticed in this paper.

So far as the brackish-water mollusca of the Laramie Group have yet been investigated, they have proved, with few exceptions, to belong to types represented by living mollusks of similar habitat; and the fresh-water and land mollusks of that group of strata belong almost wholly, if not entirely, to types that are fully represented by living species. Therefore a mere similarity or even identity of molluscan types in the strata of the different regions just enumerated would not prove them to belong to the same epoch; but it is held that an identity of species does constitute such proof.

During the season of 1877 it was my good fortune to make considerable collections of fossils from all the forenamed regions except those of the Upper Missouri River. Study and comparison of my own collections with those made many years ago by Dr. Hayden from the Judith River and Fort Union beds in the Upper Missouri River region shows an intimate relationship to exist between the molluscan fauna of each of these series respectively. This fact is illustrated to some extent by the following table, which, however, includes only the species that have been discovered in the strata of more than one of the regions, or of the subordinate groups, herein discussed. It is, therefore, by no means a summary of the invertebrate fauna of the Laramie period.

Table showing the Geographical Distribution of Species in the Laramie Group.

	Fort Union Group.	Judith River Group.	South Platte Valley.	Bitter Creek Series.	Yampa River Valley.	White River Valley.	Bear River Valley.
Ostrea wyomingensis Meek	......	*?	*	*̲	*	*	......
Anomia micronema Meek	......	......	*̲	*	*	*	......
Anomia gryphorhynchus Meek	......	.....	*	*̲	*	......	......
Brachydontes regularis White	......	.....	*̲	*	*	*	......
Unio cryptorhynchus White	......	*̲	......	*	......	......	......
Corbicula (Leptesthes) fracta Meek	......	......	*	*̲	*	*	......
Corbicula (Leptesthes) subelliptica Meek	......	*̲	*	......	......	......	......
Corbicula (Veloritina) cytheriformis M. & H	......	*̲	......	*	......	......	......
Corbicula (Veloritina) occidentalis M. & H	......	*̲	......	*	*	......	......
Corbula perundata M. & H	......	*̲	*	*	*	......	......
Corbula undifera M. & H	......	......	......	*̲	......	*	......
Bulinus longiusculus M. & H	......	*̲	....	......	......	......	*
Bulinus subelongatus M. & H	......	*̲	*	......	....	......	*
Columna teres M. & H	......	*̲	......	......	......	......	*
Macrocyclis spatiosa M. & H	......	*̲	......	......	......	......	*
Goniobasis tenuicarinata M. & H	*̲	......	*	......	......	......	......
Goniobasis gracilienta M. & H	......	*̲	*	*	......	......	......
Melania wyomingensis Meek	......	......	*	*̲	*	*	......
Campeloma vetula M. & H	......	*̲	......	*	......	......	......
Campeloma multilineata M. & H	*̲	.....	*	*?	......	....	......
Tulotoma thompsoni White	......	......	*	*̲	......	......	......

The underscore of the asterisk in the above table indicates the region in which the species thus designated was originally discovered. The double vertical line may be taken to represent the Rocky Mountains, or the great range, extending northward through Colorado, Wyoming, and Montana; the localities named on its left being east, and those on the right, west of those mountains.

The region indicated in the table as "South Platte Valley" embraces quite a large area east of the Rocky Mountains in Colorado, which is drained by the South Platte and its tributaries, and extends eastward from the base of the mountains out upon the plains, a known distance of 150 miles, and doubtless much further.

The Bitter Creek series, as here indicated, embraces all the strata that were included by Mr. Meek under the same designation in Hayden's Sixth Annual Report of the Geological and Geographical Survey of the Territories. Those of the well-known localities, Rock Springs and Black Buttes Stations, are both included in this series, and not regarded as separate, as they were in one of my former publications (Geology of the Uinta Mountains, Chapter III). The Yampa and White River Valleys are adjacent regions west of the Rocky Mountains, in Northwestern Colorado.

The strata here included under the head of "Bear River Valley" are those that have been frequently designated as the "Bear River Estuary Beds", and sometimes as the "Sulphur Creek Estuary Beds"; together with the coal-bearing series that is seen to rest upon them in the Valley of Bear River, northward from Evanston, Wyoming.

It will be seen that *Ostrea wyomingensis* is indicated with doubt as occurring in the Judith River Group. This reference is made because of the probable identity of *Ostrea glabra* Meek & Hayden, with *O. wyomingensis* Meek, and the doubt is expressed because the proof upon that point is not entirely satisfactory. The former species, as identified in the Lignitic strata east of the Rocky Mountains in Colorado, is there found to be connected by associated intermediate forms with shells that cannot be distinguished from the typical forms of *O. wyomingensis*, and therefore no doubt is expressed upon that point as regards that region. This species is not only found in the strata of the other regions indicated in the table, but in various localities within the great Green River Basin west of the Rocky Mountains it is found to range through the whole series of Laramie strata, a thickness of not less than 3,500 feet. I am also a little in doubt as to the real identity of *Campeloma multilineata* in the Bitter Creek series; but all the other species embraced in the table are probably correctly identified. Not only has the *Ostrea wyomingensis* the great vertical range in the Laramie Group which has just been mentioned, but *Anomia micronema*, *Brachydontes regularis*, *Melania wyomingensis*, and probably other species also, have an equally great vertical range; embracing, in fact, the whole thickness of the Laramie strata in the great Green River Basin, which thickness probably reaches a maximum of 4,000 feet.

It is a well-known fact that the aggregate thickness of the Laramie strata east of the Rocky Mountains in Colorado is much less than it is in either of the other regions here named. But those eastern strata *appear* to represent the whole Laramie period, because they contain all the species just mentioned that are known to range through the whole series west of the mountains, where it has its maximum thickness, and they also contain certain species associated in the same layers that appear to characterize the Fort Union and Judith River beds respectively, in the Upper Missouri River region, and not there associated together in either.

The distribution of species in the Laramie Group, on both sides of the Rocky Mountains, is too conspicuously shown by the table to need comment.

In the foregoing discussion only the species that are common to the strata of two or more of the districts here discussed have been considered. Therefore, only the faunal relationships between these regions, and not their differences, are shown. To show the latter, a consideration of all the species yet discovered in the strata of this great group is necessary. The characteristics of all the known species of the districts named, except a part of those of Bear River Valley, are in harmony with the close faunal relationship, which is shown to exist, by the few species that are named in the table.

The brackish-water branchiferous species, however (as well as the pulmonate *Rhytophorus priscus* Meek), of the Bear River Valley series, are not only of different species from any that occur in any other strata of the Laramie Group, but a part of them are of different types also. It is also true that these brackish-water species depart more widely from living types than do any of the species of other portions of the Laramie Group. In fact, not one of the species yet found in the true brackish-water strata of the Bear River series has been identified in those of any of the other regions discussed in this paper; and the evidence of the faunal relationship of this portion of the Laramie Group with the others, which is shown in the table, is confined to pulmonate mollusks alone. It is true also that the pulmonate mollusks of the Bear River Valley series that have been identified with species found in Laramie strata in other districts are apparently confined to the Evanston coal-bearing beds that overlie the portion of the series in the Bear River Valley which contains the brackish-water types. The fact that these pulmonate species of the Evanston coal-bearing beds have also been found only in the Judith River series, which probably represents the lower or earlier portion of the Laramie Group, seems to indicate that the Bear River series of brackish-water strata is still older. But this is not necessarily the case, for there is apparently no reason why we might not expect to find those species to range through the whole Laramie series, as other species have been shown to do. In other words, from our present knowledge of the facts, it appears justifiable to regard the Judith River beds as representing the earlier and the coal-bearing beds near Evanston as the later portion of the Laramie period.

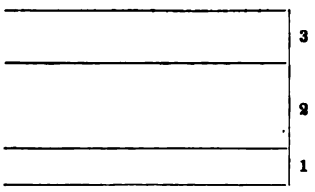
It now seems probable that we must look for the cause of the differences which the branchiferous mollusks of the strata of the Bear River Valley present, from all other portions of the Laramie Group, in a difference of physical conditions probably induced by the proximity of the western shore-line of the great Laramie inland sea; conditions that induced differential changes in the aqueous mollusks, but not thus affecting the land and palustral pulmonates.

In subsequent papers, it is proposed to discuss the relations of the Laramie Group with those above and beneath it; and also the relations of its molluscan types with those of other fossil, and also with those of existing forms.

ART. XXX.—ON SOME DARK SHALE RECENTLY DISCOVERED BELOW THE DEVONIAN LIMESTONES, AT INDEPENDENCE, IOWA; WITH A NOTICE OF ITS FOSSILS AND DESCRIPTION OF NEW SPECIES.

By S. Calvin,

Professor of Geology, State University of Iowa.



The Devonian deposits of Iowa, as now known, may be roughly represented by the annexed diagram, in which 1 indicates the position of a member of the group recently discovered at Independence, consisting of dark argillaceous, with some thin beds of impure, concretionary limestone. It has been explored to a depth of 20 or 25 feet. No. 2 represents all the beds of what have been termed Devonian limestones in Iowa, and is made up largely of limestones, with associated beds of light-colored shales; estimated thickness, 150 feet. No. 3 is a bed of argillaceous shales exposed at and near Rockford, Iowa, and is referred to in this paper as the Rockford Shales. It abounds in fossils, and weathers, on exposure, into a stiff clay, that has been utilized in the manufacture of brick; observed thickness, 70 feet.

Until quite recently, Nos. 2 and 3 of the above section were supposed to make up the entire thickness of Devonian rocks in Iowa. No. 2 not only varies, as already indicated, in lithological characters, but the grouping of fossils differs widely in different localities, so much so that competent geologists have referred certain exposures—for example, those at Waterloo—to the Corniferous, and others—as at Independence and Waverly—to the Hamilton. Such references of the above-named exposures will be found in the Twenty-third Report on the State Cabinet of New York, pp. 223–226; and in the same article Professors Hall and Whitfield declare the Rockford shales to be the equivalent of the New York Chemung. On the other hand, Dr. C. A. White—Geology of Iowa, 1870, vol. i, p. 187—is of opinion that all the Devonian strata of Iowa belong to a single epoch.

Thus matters stood until about a year or so ago, when D. S. Deering called attention to the interesting fact that a dark shale had been exposed in working out the layers in the bottom of one of the limestone quarries near Independence. The quarrymen penetrated the shale to a considerable depth in the hope of finding coal. The shale varies somewhat lithologically, but where it presents its most characteristic features it is argillaceous, fine-grained, and highly charged with bituminous matter. In some of the beds there are numerous remains of plants—stems of *Lepidodendron* and *Sigillaria* that made up the forests of the Devonian. The plants, however, are very imperfect; the form only is partially preserved, and that mainly by iron pyrite that replaced the original stem. The woody tissue of the plants has been converted into coal that occupies thin, irregular seams among the laminæ of pyrite. The little bands of coal vary in thickness, but none of those observed exceed a quarter of an inch. None of the plants are perfect enough to render either generic or specific identification possible.

The discovery of shale charged with the carbonized stems of plants below the Devonian limestone of Iowa is a matter of much interest. Frequent reports have gained circulation of the discovery of coal in drilling wells in regions occupied by Devonian rocks. From Jesup, Janesville, Marion, Davenport, and other places, such rumors have gone out. In one or two cases, shafts have been dug at considerable expense, necessarily ending in disappointment and failure.

The discovery at Independence accounts for these reports. In drilling through the limestones, the lower shales, with their carbonized plants, were reached, and the dark color of the borings, mixed with fragments of real coal, naturally enough gave rise to the impression that a veritable coal-mine had been found.

It is to be noticed that all the places from which such reports have come stand near the eastern outcrop of the Devonian, where its entire thickness could be pierced at a very moderate depth. The number and position of such localities would show that the shale in question is not a mere local deposit, but is distributed all along the outcrop of Devonian rocks in Iowa.

The researches of Mr. Deering and myself have brought to light quite a number of finely preserved Brachiopods, representing fourteen species. Of these, two are not determined and five are new to science; but the chief interest attaches to certain species that have hitherto been known only from the shales of bed No. 3, near Rockford. It will be convenient to arrange the specimens in three groups as follows:—

I. Species limited in Iowa, so far as known, to the Independence shales: *Strophodonta variabilis*, n. s.; *Gypidula munda*, n. s.; *Orthis infera*, n. s.; *Rhynchonella ambigua*, n. s.; *Spirifera subumbona*, Hall (?).

II. Species ranging throughout the entire group, and so common to beds 1, 2, and 3: *Atrypa reticularis*, Linn.

III. Species common to beds 1 and 3, but not known to occur in the intervening limestones: *Strophodonta quadrata*, n. s.; *S. arcuata*, Hall; *S. canace*, Hall & Whitfield; *S. reversa*, Hall; *Atrypa hystrix*, Hall;[*] and *Productus* (*Productella*) *dissimilis*, Hall.

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[*] The form designated here as *A. hystrix*, Hall, differs conspicuously from that described in Geology of Iowa, 1858, vol. i, part 2, p. 515, under the name of *A. aspera* var. *occidentalis*. This last occurs abundantly in the overlying limestones. The specimens from the lower shales are identical with the form presented by this *Atrypa* in the Rockford shales. For application of this specific name to this special form, see 23d nl Report of Board of Regents on New York State Cabinet, p. 225.

It is an interesting fact that of the twelve determinable species six occur only in the shaly deposits at the opening and close of the Devonian, notwithstanding these deposits are separated by 150 feet of limestone. Only one species is known to pass from the lower shales into the limestones above, and even there it appears under a form so altered that specimens from the two beds may be distinguished as readily as if they were distinct species. If we take form and surface-markings into account, the *Atrypa reticularis* of No. 1 also finds its nearest representative, not in the limestones immediately above, but in the shales at Rockford.

Obviously, then, the Independence shales are more nearly related to the Rockford beds than to any other formation in Iowa. The species in Group I seem to have disappeared with the ushering-in of conditions under which limestones were formed; they maintained themselves in some locality which has not been discovered, or from which the shaly deposits have been entirely swept away, and returned with the return of conditions favorable to their existence during the deposition of the Rockford shales.

The intimate relation between the two extremes of the group is certainly a most interesting one, and can but strengthen the conclusion of Dr. White, that all the Devonian strata of Iowa belong to a single epoch.

Brachiopods of the Independence Shale.

STROPHODONTA VARIABILIS, n. s.

Shell small, very variable, thin, orbicular to semi-oval in outline. Valves in some instances about equally convex, in other cases, notably in young specimens, the dorsal valve has the greater convexity, the ventral being flat or even slightly concave; again the ventral valve may be regularly convex, the dorsal being concave, or the dorsal valve may be convex near the back, becoming deeply concave toward the front margin.

Hinge-line straight; cardinal extremities often produced, but more frequently rounded in adult individuals. Hinge-area common to both valves, narrow, a little wider on the ventral, marked by a few strong vertical striæ corresponding to the deep crenulations of the hinge-line.

Surface marked by fine radiating and alternating striæ, which are strongly curved on the cardino-lateral areas and increase by implantation. Fascicles, of from 4 to 7 minute, low, rounded striæ, occur between each pair of larger, angular, and much more prominent ones. An imperfectly defined mesial fold sometimes seen on ventral valve. Striæ crossed by very minute, microscopic, concentric lines.

Muscular scars of ventral valve broad, short, and sharply defined by an elevated ridge. Cardinal process of dorsal valve bifid, the diverging parts slender, emarginate at tip, and fitting into notches in area of ventral valve. Entire inner surface granulose. Vascular markings obscure, except near the margin.

Length, 12; width, 15; thickness, 4 millimeters.*

Known only from the Independence shales.

STROPHODONTA QUADRATA, n. s.

Shell small, concavo-convex, quadrate in outline. Cardinal extremities sometimes abruptly produced, sometimes rounded. Ventral valve very convex, flattened on the umbo, and descending abruptly to the lateral and front margins. Dorsal valve concave, following closely the curvature of the other. Hinge-area common to both valves, wider on ventral, finely striated. Foramen only sufficiently developed to receive the extremities of the bifid cardinal process. Muscular scars faintly impressed, not definitely bounded.

Surface of ventral valve ornamented by fine radiating striæ. From 3 to 5 very small striæ are implanted between pairs of more prominent, but very slender, filiform, and often slightly interrupted ones. A broad, shallow, mesial sinus sometimes occupies the front half of the valve. On dorsal valve, the striæ are subequal, corresponding to the finer ones of the ventral.

Length, 9; width, 11; convexity, 5 millimeters.

Occurs both at Independence and Rockford.

STROPHODONTA ARCUATA, Hall.

Strophodonta arcuata, Hall, Geology of Iowa, 1858, vol. i, part 2, p. 492, plate iii, fig. 1 *a*, *b*, *c*, and 2 *a*, *b*.

Very common in the Rockford shales, and is also found at Independence.

STROPHODONTA CANACE, Hall & Whitfield.

Strophodonta canace, Hall & Whitfield, 23d Ann. Report on State Cab. of New York, p. 236, pl. xi, figs. 8–11.

The specimens in hand present some differences from the Rockford forms. Other specimens from Independence show more exact agreement.

STROPHODONTA REVERSA, Hall.

Strophodonta reversa, Hall, Geology of Iowa, 1858, vol. i, part 2, p. 494, pl. iii, fig. 4 *a*, *d*.

From Independence. Also found at Rockford, where this species is very abundant.

ORTHIS INFERA, n. s.

Shell very small, orbicular or subelliptical; valves about equally convex. Ventral valve regularly convex, with a slight indication of a mesial fold; beak prominent, erect or slightly incurved; hinge-line short, length about equal to a third of the width of shell near the middle; hinge-area narrow.

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*All the dimensions given in this paper are taken from average-sized specimens, unless otherwise stated.

Dorsal valve convex, with a fairly defined mesial sinus that is wide in front and narrows rapidly toward the beak; beak only a little less prominent than on ventral valve. Surface of both valves marked by from 24 to 30 moderately strong, rounded striæ that are separated by wide furrows and multiply by bifurcation on the front half of shell. Striæ and furrows crossed by very minute microscopic lines.

Length, 6; width, 7; thickness, 3½ millimeters.

Known at present only from the dark shales at Independence.

ORTHIS, sp.?

The surface is marked by coarse, angular striæ, and a sharp angular mesial ridge gives the valve a carinated appearance. From the Independence shale.

SPIRIFERA SUBUMBONA, Hall.

Spirifera subumbona, Hall, Pal. N. Y. vol. iv, p. 234, pl. 32, figs. 22–30.

The specimens under consideration agree very well in most characters with some forms of *Spirifera subumbona*, but, as will be seen from the figures, they differ materially in size and in the width of the hinge-area. Not known to occur in Iowa except in the Independence shales.

ATRYPA HYSTRIX, Hall.

Atrypa hystrix, Hall, Pal. N. Y. vol. iv, p. 236, pl. 53, A, figs. 15–17.
A. hystrix, H. & W., 23d Annual Rept. N. Y. State Cabinet, p. 225.
(See note at bottom of p. 726 of this Bulletin.)

The specimen in hand was collected at Independence.

ATRYPA RETICULARIS, Linn.

Atrypa reticularis of authors.

The specimens collected represent the prevailing type as this species occurs in the lower shale at Independence. It is more nearly related to Rockford forms than to the forms found in the limestones only a few feet above.

RHYNCHONELLA AMBIGUA, n. s.

Shell large, transversely oval or elliptical; valves moderately gibbous, subequally convex; mesial fold and sinus broad and well developed at the anterior margin in full-grown shells, becoming obsolete toward the umbonal region. Length and width in about the ratio of 3 to 4. Ventral valve regularly arched in the posterior part; the middle of the anterior half of the valve occupied by a broad sinus, which becomes deep and subangularly margined toward the front. A strong fold, extending about a third of the way to the beak, occupies the middle of the sinus; rudimentary folds appear on either side of the middle in the sinus of large shells. Beak of ventral valve projecting slightly beyond the other, closely incurved and appressed so as to show neither area nor foramen in perfect adult shells. Dorsal valve convex; greatest convexity near the umbo, from which it slopes gradually to the lateral and antero-lateral margins. Mesial fold confined to anterior half, broad and high in front, and divided in the middle by a wide, longitudinal, subangular furrow; rudimentary furrows on either side of the middle. Both valves with three or four plications on either side of mesial fold and sinus in adult shells; plications confined to antero-lateral margins. Postero-lateral margins and umbonal region smooth. Shell thin, translucent, scarcely fibrous.

Dimensions of a large specimen are: Length, 28; width, 41; thickness, 23 millimeters.

Confined, as far as known, to the dark shales at Independence.

GYPIDULA MUNDA, n. s.

Shell small, subtriangular to broadly ovate, inequivalve; ventral valve convex, curving almost regularly from beak to front margin; beak only moderately prominent, obtuse, slightly incurved; an indistinct mesial fold near the front margin. Dorsal valve transverse elliptical in outline, slightly convex near the beak, sloping at first somewhat abruptly and then more gradually toward the cardino-lateral margins; a broad sinus, of which the middle is occupied by a single low fold, is confined to the anterior margin. A few indistinct folds occupy the antero-lateral margins of both valves; surface otherwise smooth.

Area and foramen as in other species of this genus.

Length, 8; width, 10; thickness, 6 millimeters.

This species resembles *Gypidula occidentalis*, Hall, from which it may be distinguished by its smaller size, less prominent beak, greater proportionate width, and deeper sinus. The young *G. occidentalis* of corresponding size are entirely smooth, and show no trace of either fold or sinus. They differ also from *G. munda* in form and general proportions.

From the dark shale at Independence. The species is unknown from any other horizon.

PRODUCTUS (PRODUCTELLA) DISSIMILIS, Hall.

Productus dissimilis, Hall, Geology of Iowa, 1858, vol. i, part 2, p. 497, plate iii, fig. 7 *a–c*.

This species is abundant at Rockford, and is among the most common species in the Independence shales.

PRODUCTUS (PRODUCTELLA) sp.?

The collections from the Lower Devonian Shales contain a few specimens of this small *Productus*. It is somewhat related to *P. Shumardianus*, Hall. More material will be necessary before it can be determined.

ART. XXXI.—ON THE MINERALOGY OF NEVADA.

By W. J. Hoffman, M. D.

This report is based primarily upon the collection made in 1871 while a member of the expedition for the exploration of Nevada and Arizona.* Since that time I have received well-authenticated species from various sources, chiefly in Nevada; and those which have not come under my personal observation have been accredited to the proper authorities. The original collection is now at the National Museum, excepting in a few instances, in which the materials were consumed in making the necessary analyses. The only interesting feature which I shall mention here is the occurrence of manganiferous compounds in a belt of limestone, chiefly traceable from Austin south, and eastward toward Hot Spring Cañon. Most of the compounds containing antimony in various forms occur chiefly throughout the western portion of the State, while in the eastern portion the haloid compounds predominate. Neither of these, however, are in any way governed by the occurrence of so-called "sulphuret ores", as these are distributed pretty generally.

In addition to the above, a few remarks upon, and a list of, the thermal and mineral springs visited are added; also notice of some of the rarer minerals found in Owens Valley, California.

I embrace this opportunity of acknowledging my indebtedness to the following-named gentlemen for information and specimens which I could not have obtained through any other sources: Mr. Julius Partz, superintendent and afterward assayer of the mines in Blind Springs District, California; Mr. Richard Stretch, formerly engineer of the Virginia City Mines; Mr. Leon and the Canfield Bros., Belmont; the Messrs. Ogden, of Morey; Thomas Shaw, Gold Mountain; and Mr. W. S. Keys, superintendent of the Eureka Consolidated Mines. Dr. A. E. Foote, of Philadelphia, Pa., furnished me with several names, to which (when not on my list) his name has been appended as authority. In several instances, also, I have quoted from Professor Dana's Manual of Mineralogy for localities unknown to me personally. The localities cited are those in which the specimens named occur or did occur in their greatest purity or finest crystallizations.

Agate. See *Silica.*

Albite. In rhyolite, at Eureka and at Morey; massive, granular, at various points in Fish Lake Valley, rarely in crystals. Fine crystals in trachyte on the Colorado River.

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* Now known as United States Geographical Surveys West of 100th Meridian.

Allemontite. Locality unknown. Also reported by Dr. Foote. (Pri. com.)

Alum. See *Kalinite.*

Alunogen. At Mount Diablo, associated with kalinite.

Amethyst. On the mesa, near the mouth of Rio Virgen.

Analcite. In small crystals in the La Libertad Mine, San Antonio District. In amygdaloid in the Black Cañon, Colorado River.

Anglesite. Occurs sparingly in Railroad District, at Hyko, and at Mineral Hill. Across the State line at Partzwick, Cal., crystals were obtained measuring .34 of an inch across.

Ankerite. Occurs southeast of Camp Halleck. Locality unknown.

Sp. gr.= 2.975.

Composition:

Carbonate of lime	51.14
Carbonate of magnesia	23.48
Carbonate of iron	18.75
Carbonate of manganese	6.20
Organic matter	0.43
	100.00

Antimony. See *Stibnite.*

Apatite. In small crystals, with good terminations, at Lone Mountain.

Aragonite. Crystals nearly one inch in length, with perfect terminations, in a cave one mile south of Mineral Hill. The variety known as *Flos Ferri* occurs in small quantities.

Argentite. In small quantities in Cope and Bull Run Districts. Sparingly at Mineral Hill and Hyko; more frequent at Palmetto.

Arsenic. *Antimonial arsenic*, 17^a. A compound, consisting of arsenic, 90.82, and antimony, 9.18, (=17 As + 1 Sb), occurs in the Comstock lead of the Ophir Mine, Washoe County, "Cal." (*i.e.*, Nevada), in finely crystalline, and somewhat radiated, reniform masses, between tin-white and iron-black on a fresh fracture, but grayish black on tarnishing, unassociated with arsenolite, calcite, and quartz.*

Arsenolite. Ophir Mine. (Dana and Stretch.) Sparingly, in small quantities, at Belmont.

Astrophyllite. Rare, in small hexagonal laminæ, at Silver Peak.

Alunogen. Near Mount Diablo, frequently associated and mixed with sulphur. Dr. Loew mentions this as occurring thirty-five miles northwest of Silver Peak, having reference undoubtedly to the same locality.

Azurite. Occasionally in minute crystals at Bull Run; in thin coatings and seams at Hyko and Cope District; rather more frequent at San Antonio, Montezuma, and Philadelphia Districts. In beautiful crystals at Mineral Hill.

Beryl. Sparingly, ten miles north-northwest of Silver Peak. Some crystals have been obtained, the largest measuring .75 of an inch across. Color dull bluish-ash.

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*Dana's Manual of Mineralogy, New York, 1868, p. 18.

Biotite. In fine crystals at Silver Peak; also in the cañon about ten miles west of Palmetto.

Borax. In moderately sized crystals in the desert south of San Antonio; Death Valley.

Bornite. Sparingly in Galena and Railroad Districts.

Borono-calcite. Hot Springs. (Loew.)

Bournontite. Accompanies silver-ores at Lone Mountain.

Bromid of silver. See *Bromyrite.*

Calcite. In simple and modified rhombohedra, four inches in length, at Bull Run. Smaller crystals, occasionally scalenohedra, at Reese River. At Morey acute rhombohedra occur of various shades of pink, often rose-colored, where they are frequently associated with rhodocrosite. Two analyses show great variation of composition, although they did not exhibit any perceptible difference in measurement or coloration. No. 1 was taken from the extreme northeastern portion of the mine, and No. 2 about twenty yards southwest of that locality.

	No. 1.	No. 2.
Carbonic acid	53.74	52.36
Manganous oxide	3.87	4.97
Ferrous oxide	trace	0.21
Lime	42.28	41.42
Silicic acid	—	0.97
Loss	0.11	0.07
	100.00	100.00

These samples contain a large quantity of carbonate of manganese, but the calcite, wherever it appears in the region between Morey and Austin, contains more or less, frequently so much so as to present the characteristic tints; these, however, may to some extent be due to the presence of iron.

One mile south of Mineral Hill, in a cave, occur the following varieties:—

a. Rarely, small flat rhombohedra, with the lateral angles removed, known as nail-head spar;

b. Small scalene dodecahedra;

c. Fine aggregations of acute rhombohedra; and

d. Drusic and acicular incrustations and clusters, assuming great varieties of form.

Some of the acicular crystals measured nearly three-fourths of an inch in length, and occurred radiating from various places from the roof of the cave.

Carbonate of copper. See *Malachite.*

Carbonate of iron. See *Siderite.*

Carbonate of lead. See *Cerussite.*

Carbonate of lime. See *Calcite.*

Carbonate of manganese. See *Rhodocrosite.*

Cassiterite. The only locality where stream tin was found to occur is at the Tuscarora placer mines. Small crystals are occasionally met with.

Cerargyrite. Frequently met with in the Comstock Mine; rarely at Montezuma; in small pale brown and greenish-brown crystals at San Antonio; in fine cinnamon-brown crystals at Belmont, Philadelphia Mine; also sparingly at Bull Run; more frequent at Pioche, Reese River District, White Pine District, and at Columbus.

Cerussite. In drusic incrustations on galenite at Bull Run; massive, of dirty-white and yellowish-gray colors, in Pinto District. Occurs in elongated six-rayed crystals at Hyko. Associated with and coating clusters of crystals of anglesite at Eureka.

Cervantite. Massive and in minute crystallized coatings, sparingly, with stibnite, west of Battle Mountain.

Chalcedony. See *Silica.*

Chabazite. In small but fine crystals in La Libertad Mine, San Antonio District. Many of these crystals were coated with smaller crystals of cerargyrite.

Chalcocite. Common at Reese River District. It is said to occur with the sulphuret ores throughout the State, but the specimens received from various contributors were not labeled. Professor Dana mentions it as occurring in Washoe, Humboldt, Churchill, and Nye Counties.*

Chalcopyrite. Massive in Galena District; associated with pyrite and galenite in Railroad District.

Chalcotrichite. Sparingly in Galena District, with the ordinary crystals of cuprite, of which it is a variety.

Chrysolite. Specimens said to be from this State in Captain Rabbitt's collection at Palisade; locality unknown. Dr. A. E. Foote informs me likewise of its occurrence in Nevada.

Cinnabar. Massive, occasionally in minute acicular coatings, at Steamboat Springs. (Partz.)

Citron stone. See *Silica.*

Coal. See APPENDIX A.

Copper. Occurs in thin, arborescent leaves or sheets at Bull Run, Battle Mountain District; sparingly at Eureka and Belmont. More frequent at Galena District, where crystals of cuprite have been obtained containing minute filaments of native copper.

Corundum. Impure columnar fragments, sometimes nearly an inch in diameter, at Silver Peak.

Cuprite. In cubes, sometimes measuring .5 of an inch across, having truncated edges; twin crystals, tabular, at Galena District; frequent occurrence of fibers of native copper protruding from one or more faces of a crystal.

Datolite. In small crystals at Montezuma, Silver Peak, and Gold Mountain.

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*System of Mineralogy, etc., J. D. Dana, New York, 1868, p. 53.

Diallogite. Occasionally found at Morey, where it accompanies calcite and rhodocrosite; rarely at Reese River.

Dolomite. Is found in various portions of the limestone formations, although sometimes rarely in crystals. The variety known as *pearl spar* occurs in moderately sized crystals twenty miles south of Eureka.

A ferriferous variety, usually known as brown spar, occurs in the eastern portion of the State (exact locality unknown). This was supposed to contain a large percentage of chloride of silver, the finders arriving at this conclusion by its grayish-brown color alone. Crystals occur of from two to three inches in length. An examination of one of the samples resulted as follows:—

G. = 2.92.

Carbonate of lime	55.38
Carbonate of magnesia	39.90
Carbonate of iron	3.03
Carbonate of manganese	1.64
	99.95

Another variety found in the same region is undoubtedly *ankerite* (*q. v.*).

Embolite. In small quantities at Bull Run, Cope, and Eureka Districts; more abundant at Mineral Hill, San Antonio, Belmont, Montezuma, Palmetto, and Hyko.

Epidote. Locality unknown.

Feldspar. See *Orthoclase.*

Flint. See *Silica.*

Fluorite. In small green crystals in the White Mountains, near the dividing line between Nevada and California, west of Columbus.

Frieslebenite. Belmont. (Loew.)

Galenite. In large quantities and frequently of large cubic forms in Galena District; in cubes and dodecahedra at Reese River; a crystal of the latter variety measured over two inches in diameter. Massive and associated in moderate quantities with silver-ores in nearly all the districts to a greater or less extent.

The following varieties are found in more decided quantities in the following-named districts:—

a. Argentiferous: rarely at Belmont and Hyko; sparingly at Bull Run, Mineral Hill, and Silver Peak; abundant at Battle Mountain and Galena Districts. An exceedingly rich variety occurs sparingly four miles west of Gold Mountain.

b. Auriferous: sparingly but very rich at Silver Peak.

Garnet. Good crystals, but very small, from the Black Cañon, Colorado River. Impure, fractured crystals, nearly one and a half inches in diameter, occur.

Gay-Lussite. Sparingly in the dry soil of Fish Spring Valley.

Gold. Occurs granular, laminated, in quartz, and sometimes in tolerably large nodules in the placer mines at Tuscarora. Much of the larger sized are porous or cellular; one specimen of this character, measuring two inches in length, one in width, and over half an inch in thickness, was worth but $11.50. The outer surface was worn smooth, giving it the appearance of a solid nugget.

At Silver Peak, in quartz; sometimes in delicate arborescent forms, sometimes resembling frost-work in construction; also occurs in galenite (*q. v.*).

At Gold Mountain in metamorphic rocks. Frequently in variously tinted quartz. One fiber was found to run clean through a small nodule of malachite, and resembled native copper in its filiform variety. Five miles northwest of Gold Mountain, in the "State Line Ledge", is an exposure of auriferous quartz, 20 feet thick and over 2,000 feet in length, running northwest and southeast. Mr. Shaw, of Gold Mountain, stated that an analysis gave about $20 per ton of ore! At the same time he was one of a party of three who were contented, apparently, in working "ten-dollar ore".

The total absence of water may account for their not having worked this quartz.

In Green Mountain District, at the head of Tule Cañon, gold was found in the sand in large coarse grains.

Gold is found in many of the silver-ores throughout the State, in various quantities, but seldom sufficient to work it to the exclusion of silver.

Graphite. Ten miles northwest of Gold Mountain.

Gypsum. See *Selenite.*

Halite. In small crystals in the desert south of Columbus; in fine tabular crystals and cubes in the salt marsh near Silver Peak; in large cubes, crusts, and efflorescences in Death Valley; as an efflorescence on the banks of Rio Virgen, Black Cañon, Colorado River, and in Diamond Creek on the Arizona side of the Colorado. In large masses and cubes at Hyko; abundant at Salt Mountain, near Rio Virgen, in the southern part of the State.

Halotrichite. Locality unknown.

Hematite. Ocherous and porous at Lone Mountain. Sparingly at Bull Run and Morey. Occurs in Virgin Cañon, Colorado River, frequently associated with small quantities of the carbonates of copper. Eighteen miles southeast of Silver Peak in occasional croppings.

Hornblende. Found in small crystals at Gold Mountain. In rhyolite at Carlin, Eureka, and near Morey. Ten miles west of Mount Magruder in fine crystals.

Hübnerite. In fine columnar masses from the White Mountains. Austin.

Iodide of silver. See *Iodyrite.*

Iodyrite. In minute cubes, coating quartz and argentite, from Reese River District; sparingly at San Antonio; White Pine.

Jamesonite. Humboldt County. (Dana.)

Jasper. See *Silica.*

Kalinite. Massive and columnar, sometimes crystallized, at Mount Diablo. Specimens frequently contain small quantities of sulphur, through liquid infiltration.

Kermesite. Was reported from Eureka, which is undoubtedly an error. It was found very sparingly in Blind Spring District, California, just across the line from Columbus, during the earlier stage of development of the mines.

Küstelite. Is an auriferous silver, of a silver-white color, somewhat darker than native silver on a fresh surface. Contains silver, lead, and gold, the first much predominating. From the Ophir Mine, according to Dana.* Occurs in bean-shaped grains.

Lead (*Arsenate of*). See *Mimetite.*

Lead (*Carbonate of*). See *Cerussite.*

Lead (*Molybdate of*). See *Wulfenite.*

Lead (*Phosphate of*). See *Pyromorphite.*

Lead (*Sulphate of*). See *Anglesite.*

Lead (*Sulphuret of*). See *Galenite.*

Limonite. Lone Mountain. Is also found in many of the silver-mines.

Magnetite. In considerable quantities in Railroad District; also at Morey.

Malachite. Massive; incrustations and mammillary concretions in Copper Cañon, Galena District. Sparingly at San Antonio, Montezuma, and Belmont; more abundant at Mineral Hill.

Manganite. In small crystals, filling cavities in the limestone at Morey Mines.

Massicot. Galena. (Loew.)

Menaccanite. In propylite at and near Carlin; Eureka; Morey; Belmont.

Mica (*Common*). See *Muscovite.*

Mica (*Brown*). See *Phlogopite.*

Mimetite. Sparingly at Eureka.

Minium. Specimens exhibited to me as from Eureka were undoubtedly obtained, originally, at Blind Spring District (Rockingham Mine), California. Attempts at deception are frequently made for the purpose of making sales of specimens from so-called new localities. Found at Pioche. (Loew.)

Mispickel. At Morey, very rarely.

Moss agate. See *Silica.*

Muscovite. Found in small pieces at Carlin and Tuscarora. In fine laminæ at Silver Peak; at Eureka, Morey, and at Belmont in rhyolite. Also in the Black Cañon on the Colorado River.

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* Manual of Mineralogy, New York, 1868, p. 9.

Mysorin. Very sparingly in the La Libertad Mine at San Antonio. The quantity of material at hand for thorough determination was scarcely sufficient. The analysis, however, nearly corresponds with composition as given by Thompson (quoted by Dana, p. 715); likewise the absence of water. Differs from malachite in color and hardness, being more of reddish or brownish green, and somewhat softer. In taking the general imperfect result, it is safe to say that it approaches mysorin nearer than any other known compound.

Natrolite. Locality unknown.*

Nitre. Silver Peak. (Dana.)

Obsidian. See *Silica.*

Orthoclase. In fine blue and flesh-colored crystal in Fish Lake Valley: also at Palmetto and Gold Mountain. In small crystals in the Black Cañon.

Phlogopite. In the mountains between Silver Peak and Alida District, near the trail. Small specimens were obtained south of the mining camp at Montezuma.

Polybasite. Reese River District and at Morey.

Psilomelane. At Austin, and in less quantity at Morey.

Proustite. Reese River District. Sparingly at Morey.

Pyrargyrite. Massive, and in small crystals at Austin.

Pyrite. In cubes with tetrahedryte in Galena District. In quartz, with galenite at Cope, Belmont, and Morey.

Pyrolusite. Occurs with other manganese ores at Reese River Mines and at Morey.

Pyromorphite. Found sparingly in Bull Run, Railroad, and Gold Mountain Districts.

Quartz. See *Silica.*

Rhodocrosite. Massive and crystallized at Morey; less common at Austin.

Salt. See *Halite.*

Sanidin. Occurs in rhyolite from Carlin southward to Eureka; at Bill Williams's Mountain, Arizona, it occurs in beautiful, moderately sized crystals in trachyte.

Scheelite. Sparingly, with hübnerite, in the White Mountains; has also been observed in minute crystals from Austin.

Scolecite. Locality unknown (Foote, MS.). Story County (Dana).

Selenite. Small crystals in clusters and aggregations at Mineral Hill, Eureka, Montezuma, and San Antonio. Sparingly, in crystals half an inch in length, at Belmont. Fine large crystals from Death Valley, especially that portion near the Old Spanish Trail.

Selensulphur. Occurs sparingly at Mount Diablo. A specimen of kalinite half an inch through was coated with a semi-crystalline layer of sulphur on one side, and with a layer of dark orange-colored selensulphur on the other.

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* Dr. A. E. Foote, in a private communication.

Serpentine. Eight miles west of Palmetto Cañon; also in Darwin Cañon.

Siderite. At Bull Run, in small crystals. Poor specimens were obtained in the White Mountains.

Silica. *a.* Crystallized, at Tuscarora, where it frequently occurs in geodes, at San Antonio and Belmont. Crystals with double terminations at Gold Mountain. Small green crystals at Reese River, San Antonio.

b. *Rose quartz*, at Tuscarora, Morey, Carlin, and Silver Peak.

c. *Citron stone*, at Tuscarora, Gold Mountain, and in Palmetto Cañon.

d. *Agate*, abundant at Tuscarora, San Antonio, in Fish Spring Valley, and on the mesa west of the mouth of Rio Virgen.

e. *Chalcedony*, at Tuscarora, San Antonio, Eureka, and Virgen River mesa.

f. *Amethyst*, in small crystals, in geodes, at Tuscarora.

g. *Opal*, in magnificent colors, with silicified wood. In breaking some of the large trunks at San Antonio, fine specimens were obtained; occurs also at Tuscarora.

h. *Carnelian*, in pebbles and lumps (averaging about the size of a common walnut), of all shades, from a pure white to dark reddish-brown, on the Virgen River mesa.

i. *Onyx*, occasionally found in the same locality.

j. *Sardonyx*, same as the last.

k. *Aventurine quartz*, found on the mountain-slope east of Fish Spring Valley.

l. *Milky quartz*, on the Virgen River mesa, though very seldom.

m. *Prase*, on the mountains near Silver Peak mining-camp, rarely.

n. *Silicified wood*, at Tuscarora. Very fine at San Antonio.

o. *Jasper*, at Deep Spring Valley, near Silver Peak, and along the western border of the Virgen River mesa; usually of dull yellow or red colors. Better specimens at Gold Mountain. Abundant on the desert east of Lone Mountain.

p. *Flint* (hornstone), in the limestone south of Eureka; also east of Lone Mountain.

q. *Obsidian*, in fine pieces and very abundant ten miles southeast of Silver Peak. Across the State line (five miles), in Owens Valley, it occurs in red fragments, also banded with alternate layers of black and brown.

Silver. In small foliated masses at Bull Run; Eureka; at Belmont it sometimes occurs in fine reticulated forms. In delicate fibers in Galena District.

Silicified wood. See *Silica.*

Stembergite. Reese River. (Loew.)

Stephanite. In small crystals at Reese River and at Belmont. Occurs also in other regions.

Stetefeldtite. Sparingly at Mineral Hill, Hyko, and Eureka.

Stromeyerite. Occurs in various districts. Fine but small specimens from Comstock Lode and Belmont; also at Cope, Lone Mountain, Mineral Hill, San Antonio, Eureka, and Palmetto.

Sternberghite. In small but fine crystals at Reese River.

Sulphur. In small crystals at Carlin. In large quantities, massive and crystallized, at Mount Diablo, between thirty and forty miles northwest of Silver Peak.

Talc. Several small specimens were obtained at Reese River.

Tetrahedrite. Locality unknown. (Foote.)

Thenardite. Occurs as an acicular efflorescence on dry mud and halite, in Death Valley, ten miles south of Furnace Creek Cañon.

Tourmaline. In small greenish-brown crystals at Morey.

Trona. Death Valley, Churchill County.*

Turquois. Occurs in the mountains five miles north of Columbus. The specimens are nearly all of a pale blue color, although some finely tinted ones have been obtained.

Uxelite. Locality unknown. (Foote.)

Water. See APPENDIX B.

Wavellite. Occurs on slate near Belmont.

Wolframite. Found in the White Mountains, associated with hübnerite.

Wulfenite. Occurs in fine tabular crystals at Eureka.

Zincazurite. Found sparingly in Railroad District.

In the above list I have omitted those compounds occurring all over the State in greater or less abundance, such as *pumice, scoria, lava*, etc., they being deemed unnecessary, and not essentially of value in a simple list of minerals.

APPENDIX A.

COAL.

Unfortunately but little information can be given regarding the subject of coal and lignite. About ten miles southwest of Carlin I observed a narrow seam of lignite. This was the only representative encountered. What remarks are added below are derived chiefly from a paper† sent to the Institute of Mining Engineers by Mr. A. J. Brown, of Treasure City. I was also informed at Battle Mountain that ten or twelve miles east of that place coal of good quality was being worked. I have been unable to obtain specimens from the various mines in time for this paper, but hope ere long to be able to submit a series of analyses illustrating the value of each specimen and an average result of those sets of the respective mines.

Mr. Brown says, in allusion to the Pancake coal, that "it is rather early yet to make any estimate of the future value of the discovery, but it is certainly the most promising vein of coal yet discovered in the State of Nevada, and I believe the first true coal found west of the Rocky Mountains, or perhaps west of the Missouri River, unless some of the Utah coals belong to the coal-measures of Carboniferous age. . . . About midway between White Pine and Pancake two or three mounds, which are identical, both lithologically and paleontologically, with the limestone of Treasure Hill, crop through the Quaternary formation of the valley, and still further west are found dark bituminous shales identical with those found along the east slope of Treasure Hill and under the towns of Hamilton and Eberhardt. Some four miles still further west, and belonging to a much higher geological horizon, we find the coal formation." This gentleman further says that fossils have been found—vegetable. A few *Sigillaria* have been collected on the surface in the immediate vicinity. No analyses are given in the report, and nothing can be said regarding the actual value of the discovery. The coal above referred to is found in a vein of from five to six feet in thickness, though distorted and broken, running north and south, "and dips quite steeply (40°) to the west. . . . Several experiments at coking on a small scale have been tried, and have resulted satisfactorily."

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* Dana, Manual of Mineralogy, 1868, p. 706.

† Quoted in Mineral Resources West of the Rocky Mountains, R. W. Raymond, 1875, pp. 268, 269.

Mr. Raymond says that during the year 1874 the mine was worked to a depth of 480 feet, measured on the incline, the Eureka Consolidated Company buying the coal at the rate of from $12 to $20 per ton on the dump.

The Momomoke and Antelope Ranges have since been examined, but, as far as I have been able to learn, with but little success.

At many of the smelting works, the reduction of silver ores was accomplished by the use of charcoal. The scarcity of wood in some regions has caused some uneasiness of late, and coal must either be brought from outside sources at great expense or developed within the State, if it can be discovered in sufficient quantity and of necessary quality.

APPENDIX B.

WATER.

In giving the following list of springs, both mineral and thermal, the qualitative results only are stated. In nearly all instances there was more or less organic matter present—from local causes—so that at the end of six or eight months, when the vessels were opened, the presence of sulphureted and carbureted hydrogen gases proved that material changes had been wrought, sufficiently at least that no analyses would show what the sample was when collected. The mineral ingredients in some were unimpaired, as they were comparatively the same as when collected.

In a recent number of the Naturalist, a list of thermometric experiments is given of a number of springs in the vicinity of Silver Peak, by a gentleman* who visited the locality at the same time my observations were made. These springs are located chiefly in the western border of a large salt marsh. They run irregularly north and south, and none of them are of large extent, ranging from several feet to a few yards in diameter.

The first of these springs was originally of larger size than it is now; owing to a long-continued deposit of saline matter around the border, a crust was formed, which has gradually narrowed the opening to a diameter of not more than five feet. How far the water recedes under this formation is not known. The chief constituents of the water are borax and several compounds of soda. It is also strongly impregnated with and emits sulphureted hydrogen gas.

No. 2 is also rather saline and unfit for use. It is situated about twenty yards from No. 1, and measures about 18 feet in diameter.

Observations taken July 7, 1871.

			6.30 a. m.	7.35 a. m.
Temperature of..	Air..........	*Dry bulb*	62.4°	73.7°
		Wet bulb	—	70.8°
	Water		67.5°	69.0°

No. 3 is also saline and nearly closed over with incrustations.

Temperature.. 79°

No. 4, four feet distant from the last named, and about one hundred paces from No. 2.

Temperature.. 117°

No. 5, about ten or twelve paces from No. 6, very strongly impregnated with sodium chlorid.

Temperature .... 116.5°

No. 6, saline; the examination was made late in the day, which accounts for the difference in the temperature of the air, as given below.

Temperature of water .... 79.0°

Temperature of air .... 66.3°

No. 7 was the last upon which I took notes, and was also the most northern visited by me. Frequently emitted steam.

Temperature of water.............................. 117.8°

Lieutenant Lyle mentions several others, chiefly saline, of which the temperatures were respectively 79°, 117.8°, and 116.5°. I am inclined to believe that the last named is No. 5 of my list.

About forty miles east of Silver Peak and six or seven miles north-northeast of Montezuma we encamped near several springs located at the base of Mount Nagle, or rather the northern spur of the mountain.

No. 1 contained scarcely any saline matter, but was strongly impregnated, and emitted a great deal of sulphureted hydrogen gas.

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* D. A. Lyle, U. S. Army. <Am. Nat. vol. xii, No. 1, 1878, pp. 18–27. (*l. c.*)

No. 2, a few paces farther west; the water contained sulphate of soda in considerable abundance.

No. 3. Besides these three named, there were other small pools highly impregnated with chlorid of sodium. In all, these springs afforded but little comfort to thirsty travelers.

Two miles south of Gold Mountain, at Pigeon Springs, the water is rather scanty, but what exists is highly charged with the compounds of soda.

I was informed that east of this range, in the head of Death Valley, there was a spring the waters of which consist of nearly a saturated solution of alum. Although the information was derived from a miner of more than ordinary education, the statement can scarcely be relied upon, until samples of the water have been submitted to systematic analysis.

Near the greatest depression of Death Valley,* observations were taken on August 24, 1871, from 10.30 a.m. until 7.30 p.m. At this locality, we found a spring of palatable water, about eight feet across, and over twenty in length, around the borders of which was a fair growth of tall reeds, or tule-grass.

Sp. gr. of water at 60°, 1.008.

Temperature of water at 3 p.m., 80.7°.

Temperature of air at 3 p.m., 117°.

The thermometers were suspended from the dead branches of a mesquite-bush, clear of all materials having any local effect upon the instruments; and at some distance double blankets were suspended between the upright saplings to avoid the direct rays of the sun.

In the eastern portion of Armagoza Desert, at the base of a range of low hills, is a fine, strong spring of pure water. The locality is known as Ash Meadows, and the springs are called Grapevine Springs.

Sp. gr. of water at 60°, 1.003.

Temperature of water, 81.6°.†

A spring situated at the base of the hills running along the western edge of Diamond Valley is of doubtful character regarding the temperature. Lieutenant Wheeler, who was with me at the time, considered it safe to estimate it at 150°.‡

Deep Spring Valley furnishes a number of springs of various temperatures and qualities of water. The following were the only ones which I had an opportunity of passing.

The first was a sulphur spring, and was covered to great extent with a dense growth of grass and weeds.

Temperature of water, 65.5°; air, 82.5°.

Later in the day I passed a good-sized body of water, very alkaline, and scarcely fit to be used for cooking purposes. The spring or pond was about one hundred and twenty yards long and twenty-five yards broad.

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* East from Telescope Peak 3° 14″ N., and distant from 15 to 18 miles.

† Quoted from author's MS. by Mr. G. K. Gilbert. < U. S. Geolog. and Geograph. Sur. West of 100th Meridian, vol. iii, 1875, p. 152.

‡ *Ibidem.*

Temperature of water, 77.6°; air, 78.60°.

A short distance from this was another body of water, very clear, and free from foreign substances. It was nearly round, with an average diameter of nearly one hundred yards.

Temperature of water, 74°; air, 78°.

There were numbers of springs visited which would have been examined *en détail* but for the lack of necessary vessels for the transportation of samples. As before stated, some that were brought back for thorough analysis contained sufficient organic matter originally so as to be in a worthless condition when opened for any such purpose. In others there was an accumulation of gas, either carbureted hydrogen or sulphureted hydrogen, from the decomposition of foreign matter held in suspension. In only a few instances were the samples fit for a qualitative analysis. There should always be sufficient chemicals and appliances on hand in the field, so as to obtain some idea of the nature of the constituents present, and to submit duplicates to critical examination, if possible, at the earliest convenient time and place.

APPENDIX C.

NOTE ON THE RARER MINERALS FOUND IN OWENS VALLEY, CALIFORNIA.

Blind Spring District, located in the upper end of Owens Valley, furnished some beautiful examples of crystallized compounds, until the mines reach a depth of over 200 feet, when water-level was reached. Beneath this, the "heavy sulphuret ores" occur, where the volatile compounds, or those containing iodine, bromine, chlorine, antimony, or arsenic, are rarely found. The latter occur above, where, through various physical causes, compounds containing one or more of these elements are formed. Good crystals of most minerals are scarce throughout the extreme West as a rule; but at times fine examples occur, though not in abundance, excepting in a few instances.

1. *Angelsite.*—Crystals half an inch in length and a quarter of an inch thick have been secured in small quantities.
2. *Argentite.*—Small specimens of great purity.
3. *Azurite.*—In fine masses and clusters of crystals.
4. *Cerussite.*—In small but brilliant crystals.
5. *Cuprite.*—In cubes 0.4 of an inch across. Brilliant and perfect.
6. *Malachite.*—In small but beautiful masses.
7. *Mimetite.*—Sparingly, with other compounds of lead.
8. *Minium.*—Rarer than the last-named.
9. *Partzite.*—Rather abundant shortly after the opening of the mines.

The ore yielded from $500 to $1,500 silver per ton. Choice specimens yielded even more

Another compound was found associated with partzite, which the miners distinguished under the local name of bismarckite. There was not much that could be secured, and shortly after my return several specimens were sent to Professor Chandler, of Columbia College, N. Y., for determination. No satisfactory results were obtained of the small quantity. The mineral, according to Mr. Partz, acted differently from partzite in the furnace. It was not as hard as the latter, rather granular at times, sometimes of a yellowish color; frequently there were bands of yellow and dark greenish-black. In appearance it looked as if it were a mechanical mixture of *embolite* and *partzite*.

10. *Pyromorphite.*—In small but fine crystallizations, passing through various shades of green, through pale brown, into dark olive.

11. *Siderite.*—Very fine crystals; perfect.

12. *Sphalerite.*—Mr. Partz informs me that beautiful crystals of various shades of pale greenish-yellow, light, and dark brown colors have recently been found in the Comanche Mine, Blind Spring District. He has found in massive varieties as much as $2,100 silver per ton.

13. *Stetefeldtite.*—In small quantities, but making fine cabinet specimens.

14. *Stromeyerite.*—Occasionally, in moderately sized specimens.

15. *Strontianite.*—This has been recently found in small quantities, well crystallized, at the mines at Cerro Gordo, in the southeastern portion of Owens Valley, near the Nevada State line.

At or near the same place, arsenolite has been found in small quantities, having observed it myself. The presence of this mineral in that range gives some color to the prospectors' tale of a spring of poisonous water further south. I have been told repeatedly, by various parties, that dead jackass-rabbits and other small game have been found near there in all stages of decomposition, or "dried up". Such is possible, as decomposition of the mineral may furnish soluble salts of arsenic, even in small quantities, which in time may become very strong through concentration by the evaporation of the water.

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ART. XXXII.—THE FOSSIL INSECTS OF THE GREEN RIVER SHALES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The following descriptions are published to afford some notion of the nature and extent of the insect remains found in the immediate vicinity of Green River Station on the Union Pacific Railroad in Wyoming. Illustrations of all of them have been prepared for a general work on the Tertiary insects of North America, to be published by this Survey.

With a very few exceptions, the specimens were found in a restricted basin, about six kilometres west of the town, exposed by a railway cutting called the "Petrified Fish Cut", from the vast number of fish remains discovered here in building the road. The insects were obtained in the first instance by Dr. Hayden, who brought home a few specimens only; next, Mr. F. C. A. Richardson placed in my hands a considerable collection;* and last summer my untiring friend Mr. F. C. Bowditch and myself spent several days working the shales.

The mass of the specimens from this locality are irrecognizable, and those to the nature of which some clue can be obtained are generally fragmentary; wingless and often legless trunks are very common, and lead to the suggestion that the specimens had undergone long maceration in somewhat turbulent waters before final deposition. The zoological nature of the fauna will be fully considered at another time, and it need only be remarked now that one cannot avoid noticing the tropical aspect of the recognizable forms. More than eighty species are here enumerated. One or two only can be (doubtfully) referred to species described from the White River beds,† referred by Lesquereux to the same horizon.

I must here express my indebtedness to Mr. G. D. Smith of Cambridge, who, with great liberality, has enabled me at all times to use his rich collections of *Coleoptera*, which chance to be specially valuable for my purpose from the intercalation of Mexican forms in the North American series.

HYMENOPTERA.

FORMICIDÆ.

Lasius terreus.—A single specimen (No. 14692) obtained by Dr. Hayden at the "Petrified Fish Cut", Green River (alluded to in his Sun Pictures of Rocky Mountain Scenery, p. 98), is probably to be referred to this genus, but is in rather a poor state of preservation. The head is small and rounded, with antennæ shaped as in *Lasius*, but of which the number and relative length of the joints cannot be determined, from their obscurity; the long basal joint, however, appears to be comparatively short and uniform in size, being not quite so long as the width of the head, while the rest of the antennæ is more than half as long as the basal joint, and thickens very slightly toward the apex. The thorax, preserved so as to show more of a dorsal than a lateral view, is compact, oval, less than twice as long as broad, with no deep separation visible between the meso- and metathorax, tapering a little posteriorly. The peduncle, as preserved, is a minute, circular joint, but from its discoloration appears to have had a regular, rounded, posterior eminence. The abdomen consists of five joints, is very short-oval, very compact and regular, and of about the size of the thorax, although rounder. The legs are long and slender, the femora of equal size throughout, and all the pairs similar. There is no sign of wings, and the specimen is probably a neuter.

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* See American Naturalist, vi, 665–668; Bulletin of this Survey, ii; No. 1, 77–87.

† See Bulletin of this Survey, iii, No. 4, 741–762.

Length of body 7.5^{mm}, of head 1.4^{mm}, of thorax 3.2^{mm}, of abdomen 2.9^{mm}; breadth of head 1.1^{mm}, of thorax 1.9^{mm}, of abdomen 2.2^{mm}; diameter of peduncle 0.55^{mm}; length of first joint of antennæ 1^{mm}, of rest of antennæ 1.65^{mm} (?).

MYRMICIDÆ.

Myrmica sp.—A species of this family was found by Mr. Richardson (No. 53), but a specific name is withheld in the hope of finding better material on which to base it. The head is rather small, circular; the thorax very regularly ovate and nearly twice as long as broad; the peduncle small, and composed of two adjoining circular masses, the hinder slightly the larger; the abdomen is much broken, but evidently larger than the thorax and pretty plump; no appendages are preserved.

Length of body 3.3^{mm}; diameter of head 0.4^{mm}; length of thorax 1.2^{mm}; width of same 0.75^{mm}; length of peduncle 0.25^{mm}; diameter of anterior joint of same 0.1^{mm}; width of abdomen 0.85^{mm}, its probable length 1.8^{mm}.

BRACONIDÆ.

Bracon laminarum.—A single specimen and its reverse (Nos. 4196, 4197) show a body without wings or other appendages. The head is quadrate, broader than long, and nearly as broad as the thorax. The thorax is subquadrate, either extremity rounded, about half as long again as broad, the sides nearly parallel, and the surface, like that of the head, minutely granulated; abdomen fusiform, very regular, in the middle as broad as the thorax, as long as the head and thorax together, tapering apically to a point, and composed apparently of six segments.

Length of body 2.8^{mm}, of head 0.6^{mm}, of thorax 0.85^{mm}, of abdomen 1.35^{mm}; breadth of head 1.1^{mm}, of thorax 1.2.

CHALCIDIDÆ.

Decatoma antiqua.—On the same stone (No. 4076) as *Lystra Richardsoni*, but at a slightly higher level, is a minute Chalcid fly. The wings are wanting, but the whole of the body is preserved, together with the antennæ. The head is large, arched, and otherwise well rounded, the face tapering below, the eyes large, deep, with their inner borders nearly parallel, leaving an equal front; the base of the antennæ cannot be made out, but beyond the long basal joint are six nearly equal quadrate joints, increasing very slightly indeed in size away from the head, scarcely so long as broad, the apical joint subconical, scarcely longer than the penultimate. Thorax compact, globose, minutely granulated, like the head; the abdomen also compact, arched, the tip rounded; beyond it, the ovipositor extends very slightly, apparently by pressure.

On a stone collected by Mr. Richardson (No. 86) is pretty certainly another specimen of this species, in which the abdomen is distorted by pressure; the abdomen shows this by the rupture of the integument, and the result is an apparently slenderer abdomen; it is also a female, with exactly the same parts preserved, with the addition of the other antenna; but both antennæ are more obscure than in the other specimen, especially at the apex; they appear, however, to enlarge more rapidly, and may be clavate at the tip, in which case the insect cannot be the same.

Length of body (of No. 4076) 1.85^{mm}, of abdomen 0.95^{mm}, of antennæ beyond basal joint 0.4^{mm}; width of penultimate antennal joint 0.045^{mm}.

DIPTERA.

CHIRONOMIDÆ.

Chironomus sp.—A minute specimen (No. 141), apparently of this family, was taken by Mr. Richardson. Unfortunately, it has no wings, and little can be said of it, more than to record its occurrence; it is 3^{mm} long, has large eyes, a stout thorax, and altogether resembles a *Chironomus;* it is, however, distinct from any found by Mr. Denton in the White River shales.

TIPULIDÆ.

Dicranomyia primitiva Scudd.—A single wingless male (No. 16), taken by Mr. Richardson, can be referred doubtfully to this species, originally described from White River.

About fifteen other specimens of *Tipulidæ* were collected by Mr. Richardson, Mr. Bowditch, and myself at the same spot, but, unfortunately, not one of them presents the vestige of a wing, and seldom anything more than the body; probably some of them also belong to the above-named species; others may with more doubt be referred to *D. stigmosa* Scudd.; but all are valueless for any precise determination, and, indeed, may not belong to *Dicranomyia* at all.

MYCETOPHILIDÆ.

Diadocidia? terricola.—This species is founded upon a single wing (No. 125) found by Mr. Richardson, differing to such a degree from *Diadocidia* that I only place it here because the only other reasonable course would be to refer it to a new genus, which would necessarily be conjectural, from the imperfection of the fragment. If a transverse vein exists in the middle of the wing, it must unite the fourth longitudinal vein with the second, and not, as in *Diadocidia*, with the third. The wing itself is shaped much as in *Diadocidia*, and, at least near its costal border, is covered with fine hairs arranged in rows parallel to the course of the neighboring veins; one of these rows in the costal cell is so distinct as to appear like a vein parallel to and lying within the auxiliary vein. The auxiliary vein terminates in the costal margin far beyond the middle of the wing, a feature apparently unknown in *Mycetophilidæ;* the first longitudinal vein terminates only a little further beyond, and, as in *Diadocidia*, there is no transverse vein connecting them; the second longitudinal vein terminates a little above the apex of the wing, curving downward at its extremity and apparently surpassed a little by the marginal vein; the third longitudinal vein originates from the second at only a short distance before the middle of the wing, and soon forks, or at about the middle of the wing; the fourth longitudinal vein is perhaps connected with the second at the point where it parts with the first by a cross vein perpendicular to the costal margin; at least, it is elbowed at this point, its basal portion running, parallel to the costal margin, to the fifth longitudinal vein, which, beyond this point, has a gently sinuous course, and diverges rather strongly from the fourth; the sixth vein cannot be traced, although the axillary field is broad, very much as in *Diadocidia*, and the inner margin distinct.

Probable length of wing 3.6$^{\mathrm{mm}}$; its breadth 1.45$^{\mathrm{mm}}$.

Sackenia sp.—No. 7 of Mr. Richardson's collection represents a species of *Mycetophilidæ* apparently belonging to this genus, so far as can be determined. It closely resembles *Sackenia arcuata* Scudd. from the White River shales, but differs from it in its smaller size and in possessing a proportionally larger and more arched thorax; the legs also appear to be shorter. Besides the body and (indistinctly) the antennæ and legs, only the upper portion of the wings remain, consisting of the costal margin and first and second longitudinal veins, with the cross vein uniting them; these wholly agree with the same features in *S. arcuata*, excepting that the second longitudinal vein terminates a little higher up.

Length of body 3.75$^{\mathrm{mm}}$, of wings 2.9$^{\mathrm{mm}}$.

Three other species of *Mycetophilidæ* occur among the specimens collected by Mr. Bowditch and myself, but they are indeterminable from their fragmentary condition. One of them, No. 4134, has indeed the remnant of a wing, but the portion of the venation preserved is only sufficiently characteristic to enable us to judge that it belongs in this family. The thorax is strongly arched, and the full and tapering abdomen indicates a female; the head is gone; the thorax and abdomen are 3.5^{mm} long, and the wing probably 3^{mm} long.

Another of them, No. 4114, has a portion of the base of a wing, in which the forking of the fifth and sixth longitudinal veins is very close to the base, as in *Sackenia*, but nothing more can be said concerning it; the thorax is very globular and the abdomen short.

Length of thorax and abdomen 3.65^{mm}.

The third species is represented by two specimens on one stone (No. 4205) which came from the buttes opposite Green River Station, and is the only fly which had the slightest value found in four days' search. One of the specimens is a pupa and the other an imago, apparently of the same species and distinct from either of the preceding, with a longer thorax and slenderer abdomen, provided with large ovate anal lobes.

Length of thorax and abdomen 5^{mm}.

ASILIDÆ.

Stenocinclis (στενός, κιγκλίς), nov. gen.

This genus of *Asilidæ* is founded wholly upon characters drawn from the neuration of the wing, the only portion of the insect preserved. It falls into the group of *Dasypogonina*, in which the second longitudinal vein terminates in the margin apart from the first longitudinal vein, instead of uniting with it just before the margin. It is not very far removed from *Dioctria*, but differs from it and from all *Asilidæ* I have examined in that the third longitudinal vein arises from the first before the middle of the wing, instead of from the second longitudinal vein after its emission from the first; the first longitudinal vein has therefore two inferior shoots, giving the wing a very peculiar aspect, and causing it to differ radically from all other *Asilidæ*; indeed, it would be hard to know where to look for a similar feature among allied *Diptera*, unless it be in the anomalous group of *Cyrtidæ*. The wing is very slender, and all the cells unusually elongated, which also gives it a unique appearance.

Stenocinclis anomala.—This species is represented by a single fragment of a wing (No. 4143), which I found in the Green River shales. Nearly all the neuration is preserved; but the posterior margin is absent, and the length of the cells which border upon it cannot be accurately determined. The insect was evidently small, with a long and slender wing. The auxiliary vein terminates slightly beyond the middle of the costal margin; the first longitudinal vein runs up toward the margin where the auxiliary vein terminates, and follows along next the edge far toward the tip, as usual in this group; the second longitudinal vein originates from the first a little way before the middle of the wing, and with an exceedingly gentle sinuous curve, turning upward apically, terminates a little way beyond the first longitudinal vein; the third longitudinal vein originates from the first as far before the origin of the second longitudinal vein as the distance apart of the tips of the first and second longitudinal veins, and running at first parallel and almost as close to it as the first longitudinal vein to the apical half of the costal margin, but distinctly separate throughout, it diverges slightly from it at the middle of the wing and terminates at the lower part of the apex of the wing, curving downward more strongly toward the margin; at the middle of the divergent part of its course, which is very regular, it emits abruptly a superior branch, which afterward curves outward and runs in a very slightly sinuous course to the margin, curving upward as it approaches it. The fourth longitudinal vein is seen to start from the root of the wing, and runs in a straight course until it reaches a point just below the origin of the second longitudinal vein, where it is connected with the vein below by the anterior basal transverse vein, and then bends a little downward, running nearly parallel to the third longitudinal vein, but continuing in a straighter course, terminates on the margin at nearly the same point; these two veins are connected by the small transverse vein midway between the anterior basal transverse vein and the forking of the third longitudinal vein; the fourth longitudinal vein is connected by the posterior transverse vein (which is scarcely as long as the small transverse vein) with the upper apical branch of the fifth longitudinal vein just beyond its forking, or opposite the forking of the third longitudinal vein; the fifth longitudinal vein forks previously to this, emitting a branch barely before the point where the anterior basal transverse vein strikes it, so that the branch almost appears to be a continuation of the transverse vein; and previous to this it has a distinct angle, where another vein is thrown off at right angles, directly opposite the upper extremity of the anterior basal transverse vein, and beyond the origin of the third longitudinal vein; the basal half only of the sixth longitudinal vein can be seen, but its direction shows that it unites with the lowest branch of the fifth at its apex, as in *Dasypogon*. All the cells throughout the wing are exceedingly narrow.

Length of wing 6.75^{mm}; probable breadth 1.6^{mm}.

SYRPHIDÆ.

Milesia quadrata.—A specimen (No. 14691) in a fine state of preservation, although not perfect, and with most of the neuration of the wing concealed under hard flakes of stone which cannot be wholly removed, was found by Dr. Hayden at the "Petrified Fish Cut", Green River. It is the larger fly alluded to in Dr. Hayden's Sun Pictures of Rocky Mountain Scenery, p. 98. The head and thorax are black, the head large, nearly as broad as the thorax, the eyes large, globose, as broad as the summit of the head between them, the front very large, prominent, half as broad as the head, and half as long as broad. Thorax globose, a little longer than broad, largest in the middle. Wings surpassing slightly the abdomen; the third longitudinal vein originates from the second in the middle of the wing, is very gently arcuate (the convexity backward) in its outer half, and appears to terminate just above the tip of the wing; the fourth longitudinal vein is united by an oblique cross-vein to the third very near the origin of the latter, and the spurious longitudinal vein cannot be made out, from poor preservation; the marginal vein between these two appears to be very simple, the fourth longitudinal vein bending downward at its tip to meet it. The abdomen is as broad as the thorax, fully as long as the rest of the body, broad-ovate, tapering slightly at the base and rapidly beyond the middle, broadest at the second segment; the first segment is longest, and half as long as broad, the second and third slightly shorter, the fourth still shorter, and the fifth minute; the abdomen is light-colored, probably yellow in life, and the first three segments are rather narrowly margined posteriorly with black; the first segment is also similarly margined in front, and besides has a median black stripe of similar width, which divides the segments into equal lateral quadrate halves,—whence the specific name; the whole abdomen is rather profusely covered with very brief, black, microscopic hairs, which are thickest in the black bands bordering the segments, and next the hind edge of the fourth and fifth segments, producing a dusky posterior margin, similar to but narrower than the dark belts of the preceding segments, and of course very inconspicuous.

Length of body 18^{mm}, of head 2.85^{mm}, of thorax 5.65^{mm}, of abdomen 9.5^{mm}; breadth of front 2.4^{mm}, of head 4.5^{mm}, of thorax 6^{mm}, of abdomen 6^{mm}; probable length of wing 14.5^{mm}; length of hairs on abdomen 0.04^{mm}; width of dark abdominal bands 0.5^{mm}.

Cheilosia ampla.—This species is primarily founded on a single specimen (No. 4112) which Mr. Bowditch and I found in the Richardson shales at Green River, and which preserves nearly all parts of the insect. There is also a specimen with its reverse (Nos. 4135, 4141) which we obtained at the same place, and another (No. 40) which Mr. Richardson sent me from these beds, agreeing with the first-mentioned specimen, but a little larger. As only the bodies are preserved, they are temporarily placed in this connection, until other material is at hand, while the species is described wholly from the more perfect individual. This has a body more nearly of the shape of an *Orthoneura*, the abdomen being broader and stouter than is usual in *Cheilosia;* but the wings are much longer than in the species of *Orthoneura* I have seen, and both the shape of the wing and its neuration agree well with *Cheilosia.* The head is round and moderately large, the thorax stout and rounded ovate, the scutellum large, semilunar, twice as broad as long; all these parts are dark brown. The wings are very long and narrow, extending much beyond the tip of the abdomen, the costal edge very straight until shortly before the tip, where it curves rapidly; all the veins are very straight, especially those of the upper half of the wing; the auxiliary vein terminates in the middle of the costal border, the first longitudinal at the extremity of the straight part of the costa, beyond the middle of the outer half of the wing, the third at the tip of the wing, and the second midway between the first and third; the third is united to the fourth by a straight cross-vein in the middle of the wing, directly beneath the tip of the auxiliary vein, and about its own length beyond the extremity of the long second basal cell; the extremity of the third basal cell is very oblique and reaches the tip of the lower branch of the fifth longitudinal vein; the marginal vein, uniting the third and fourth veins, strikes the former just before the tip, while that uniting the fourth and fifth, toward which the fourth bends to receive it, is removed further from the margin by about half the width of the first posterior cell. The legs are slender, scantily clothed with short, fine hairs. The abdomen is broad, oblong ovate, fully as broad as the thorax, broadly rounded at the apex, no longer than the rest of the body, of a light color, with darker incisures, and scantily covered with delicate hairs; it is composed of five segments, of which the second, third, and fourth are of equal length, the first shorter and suddenly contracted, the apical minute.

Length of body 7^{mm}; diameter of head 1.35^{mm}; length of thorax 2.5^{mm}; breadth of same 2^{mm}; length of abdomen 3.5^{mm}; breadth of same 2.2^{mm}; length of wing 6.4^{mm}; breadth of same 1.8^{mm}; length of hind femora 1.25^{mm}, of hind tibiæ 1.25^{mm}, of hind tarsi 1.25^{mm}.

Cheilosia sp.—Two specimens (Nos. 4113, 4150) of a smaller species of *Syrphidæ*, preserving the bodies, agree so completely with the last-mentioned species, excepting in their much smaller size, that they are referred to the same genus; but as the wings are almost entirely lost, the reference is only made to indicate the approximate place of the species, which need not be described until better material is at hand. The length of the body is 4.25^{mm}.

Syrphus sp.—A fourth species of this family, and second only to the *Milesia* in size, is represented by two specimens, reverse and obverse (Nos. 4110, 4132), which are too imperfect for description, only the body being preserved; the form and size of this agree best with the genus *Syrphus*. The length of the body is 10^{mm}.

MYOPIDÆ.

Poliomyia (πολιός, μυῖα), nov. gen.

This genus of *Myopidæ*, most nearly allied to *Myopa*, appears in the neuration of the wings to resemble closely some genera of *Syrphidæ*, especially *Xylota* and *Milesia*, but it altogether lacks the spurious longitudinal vein, and the third, fourth, and fifth longitudinal veins are not united at their extremities by marginal veins; indeed, they run, without swerving, and subparallel to one another, to the margin. In this respect, the genus differs also from other *Myopidæ*, as it does also in the extreme length of the third basal cell, which is as long as in *Syrphidæ*. In these points of neuration, it would seem to agree better with the *Pipunculidæ*, which family, however, is entirely composed of very small flies, so that it seems better with our imperfect knowledge of the fossil to refer it to the *Myopidæ*. The body resembles that of *Syrphus* in general form. The wings are as long as the body, and slender, with very straight veins; the auxiliary and first to fourth longitudinal veins are almost perfectly straight, the third originating from the second longitudinal vein at some distance before the middle of the wing; the auxiliary vein terminates beyond the middle of the costal margin; directly beneath its extremity is the small transverse vein, and about midway between the latter and the margin the large transverse vein uniting the fourth and fifth veins; the extremity of the second basal cell is further from the base than the origin of the third longitudinal vein, and the third basal cell reaches very acutely almost to the margin of the wing.

Poliomyia recta.—The single specimen (No. 14696) referable to this species was obtained by Dr. Hayden at the "Petrified Fish Cut", and represents a dorsal view of the insect with the wings partly overlapping on the back. It is the smaller fly referred to in Dr. Hayden's Sun Pictures of Rocky Mountain Scenery, p. 98. The head is broken; the thorax is stout, rounded-ovate, and blackish; the scutellum large, semilunar, and nearly twice as broad as long, with long black bristles along either lateral edge and along the sides of the thorax posteriorly. The wings are long and narrow; the auxiliary vein runs into the margin just beyond the middle of the wing; the first longitudinal vein runs into the margin at about two-thirds the distance from the tip of the auxiliary vein to that of the second longitudinal vein, and scarcely turns upward even at the tip; the straight second and third longitudinal veins diverge from each other at the extreme tip after running almost parallel throughout the length of the latter, which originates from the second some distance before the middle of the wing; the small tranverse vein between the third and fourth longitudinal veins lies just beyond the middle of the wing and perpendicular to the costal border, while the large transverse vein between the fourth and fifth longitudinal veins is perpendicular to the latter, and renders the discal and second posterior cells of about equal length. The abdomen is apparently lighter-colored than the thorax, regularly obovate, as broad as the thorax, and longer than it, its terminal (fifth) segment small, the others large and subequal.

Length of thorax and scutellum 4^{mm}; breadth of same 2.75^{mm}; length of abdomen 4.5^{mm}; breadth of same 2.75^{mm}; length of wing 6.5^{mm}; breadth of same 2.25^{mm}.

I am indebted to Mr. Edward Burgess for some critical remarks upon the affinities of this fly, and for a careful sketch of the neuration, which is very difficult to trace in certain places.

DOLICHOPIDÆ.

Dolichopus sp.—A specimen and its reverse (Nos. 4124, 4148) is to be referred to this family by the structure of the abdomen and its general aspect. The wings and head, however, are wanting. The thorax is globose, well arched, and, like the abdomen, of a light brown color, and ornamented with scattered, bristly, black hairs. The tip of the abdomen is recurved beneath. The length of the fragment is 3.65^{mm}.

TACHINIDÆ.

Tachina sp.—To this is referred provisionally a small but stout and densely hairy fly (No. 48^b, obtained by Mr. Richardson), with thick, slightly tapering abdomen, broadly rounded at the tip, long wings with heavily ciliated costal margin, the auxiliary vein terminating a little before the middle, and the first longitudinal vein not very far before the tip; the other veins of the wing cannot be determined. The legs are pretty stout and densely haired. About the fly are scattered many arcuate, tapering, spinous hairs 0.7^{mm} long, evidently the clothing of the thorax.

Length of body 4^{mm}; breadth of thorax 1.25^{mm}; length of wings 4^{mm} (?), of hind femora 0.6^{mm}; hind tibiæ 1.25^{mm}; hind tarsi 1.25^{mm} (?).

SCIOMYZIDÆ.

Sciomyza? manca.—This fly, extremely abundant in the Green River shales—in fact, outnumbering all the other *Diptera* together—is temporarily placed in this genus, because its characters seem to agree better with those of the family *Sciomyzidæ* than of any other; yet it cannot properly be placed in any of the genera known to me. I should be inclined to place it near *Blepharoptera* in the *Helomyzidæ*, but all the tibiæ are bristled throughout. Its general appearance is that of the *Ephydrinidæ*, but the bristly surface of the middle tibiæ would allow us to place it only in the *Notiphilina*, from which it is excluded by the want of pectinations on the upper side of the antennal bristle. The want of complete neuration prevents me from designating it at present by a new generic name, which it can hardly fail to require as soon as that is known; only two or three of the three score specimens before me have any important part of the wings, and this constant fragmentary condition of the fossils has suggested the specific name. The genus in which it would fall may be partially characterized as follows:—Body compact, stout; the head comparatively small, perhaps one-third the bulk of the thorax, about three-fourths its width, with large, naked eyes, the front between them nearly equal and pretty broad, obliquely sloped and slightly tumid on a side view, so as to project considerably below; a few curved bristles project from its summit. Antennæ with the flagellum subglobose, scarcely longer than broad, much larger than the joints of the scape, and bearing at its tip above a curved, rather short, naked, tapering style, *scarcely longer than the flagellum* proper and bluntly pointed; in several specimens in which this part is pretty well preserved, this is invariably its character, and no terminal thread can be seen in any of them, nor any indication of joints in the style; this brevity of the style seems to be peculiar. As far as the neuration of the wing can be made out (there must remain some doubt upon this point until better examples are discovered), the course of the auxiliary vein cannot be determined; the first longitudinal vein appears to end before the middle of the costal border; the second originates abruptly from the middle of the first longitudinal vein, and terminates (certainly) only a little way before the tip of the wing; the third runs very nearly parallel to the second longitudinal vein, terminates at the tip of the wing, and is perhaps connected by a cross-vein with the fourth longitudinal vein scarcely within the extremity of the first longitudinal vein; the fourth longitudinal vein originates from the fifth or sixth a little before the origin of the second longitudinal vein, diverges rapidly from the third beyond this connection, and is arcuate, curving upward again before reaching the posterior border and running outward to the outer border; the fifth longitudinal vein curves still more strongly from the fourth, until it reaches the middle of the posterior border, to which it suddenly drops, and scarcely above which it is united with the fourth longitudinal vein by a long, oblique cross-vein. The femora are stout, the front pair largest at the base and tapering, the other pairs subequal throughout, all armed externally above and below with a row of very delicate, nearly straight spines, the upper row perhaps wanting on the middle femora, and the lower row developing into longer and stiffer bristles on the apical half of the fore femora. The tibiæ are equal, a little longer than the femora, considerably slenderer, but still rather stout, furnished alike with several straight, longitudinal rows of minute spines, and on the outer side with three or four distant, moderately stout, longer spines (less prominent on the fore tibiæ than on the other legs), and at the tip with a cluster or several similar spines or spurs. The tarsi are very much slenderer than the tibiæ, longer than they, the other joints slenderer than the metatarsus, all profusely armed with exceedingly delicate spines or spinous hairs, arranged regularly in longitudinal rows; at tip is a pair of very slender, pretty long, strongly curved claws, and apparently a pretty large pulvillus.

The brevity of the antennal style, the length of the first longitudinal vein of the wing, the approximation of the middle transverse vein to the base, the strong arcuation of the fourth longitudinal vein, the obliquity of the posterior, large, transverse vein, and its approach to the posterior margin, the bristly nature of the legs, and the length and comparative slenderness of the tarsi—all, excepting parts of the neuration, characters open to little question—render this fly peculiar and its exact location somewhat dubious. When, however, the neuration of the wing is sufficiently well known to enable us to understand more definitely the character of the basal cells, and other parts of the base of the wing, the relation of the auxiliary to the first longitudinal vein, and to map unquestionably the whole course of the fourth longitudinal vein, we shall probably be able to arrive at very precise conclusions.

In addition to the features above mentioned, it may be added that the thorax is subquadrate, scarcely longer than broad, furnished with distant, long, curving bristles disposed in rows, but in no individual well enough preserved to give further details of distribution. The abdomen is composed of five visible, subequal joints; its mass compact, scarcely constricted at the base, regularly and pretty strongly arched on a side view, tapering rapidly on the apical half to a bluntly rounded apex, the surface abundantly clothed with rather delicate spinous hairs, those at the posterior edge of the segments longer, and forming a regular transverse row. The metatarsus of the middle leg is proportionally longer than in the others, where it is about half as long as the other joints combined.

Measurement of average individuals:—Length of body as curved 4.25^{mm}, of head 0.65^{mm}, of thorax 1.7^{mm}, of abdomen 2.2^{mm}; breadth of head 0.85^{mm}, of thorax 1.25^{mm}, of abdomen 1.4^{mm}; length of flagellum of antennæ 0.16^{mm}, of style 0.19^{mm}, of wing 3.4^{mm}?; breadth of same 1.2^{mm}; length of femora 0.75^{mm}, of tibiæ 0.95^{mm}, of fore tarsi 0.85^{mm}, of middle tarsi 1.5^{mm}, of hind tarsi 1.6^{mm}, of fore metatarsi 0.4^{mm}, of middle metatarsi 0.64^{mm}, of hind metatarsi 0.48^{mm}; breadth of femora 0.28^{mm}, of tibiæ 0.12^{mm}, of metatarsus 0.08^{mm}, of tip of tarsi 0.05^{mm}; length of claws 0.09^{mm}.

Sciomyza ? disjecta.—A second species, apparently of the same genus as the last-mentioned, but smaller, is found in considerable numbers in the same bed, although in far less abundance than the last, a dozen specimens having been found by Mr. Richardson, Mr. Bowditch, and myself. The wings appear to be proportionally shorter than in the last species, with a rather broader space between the veins in the upper half of the wing, indicating perhaps a broader wing. The legs are slenderer, the disparity in the stoutness of the tibiæ and tarsi is not so great, and the tarsi are proportionally shorter; the legs are also as densely, though less coarsely, spined, and a similar delicacy is observable in the hairiness of the body. All the specimens are preserved on a side view, and the last species are in a like fragmentary condition.

Length of body of an average individual 3.2^{mm}, of head 0.55^{mm}, of thorax 1.2^{mm}, of abdomen 1.8^{mm}, of wing 2.4^{mm}?, of hind femora 1.2^{mm}, of hind tibiæ 1.4^{mm}, of middle and hind tarsi 1^{mm}.

COLEOPTERA.

CARABIDÆ.

Cychrus testeus.—A single specimen (No. 4059) with its broken reverse (No. 4100) shows a pair of elytra slightly misplaced. They appear to represent a small species of *Cychrus* allied to *C. angusticollis* Fisch., but without the irregularities which mark the furrow formed by the marginate outer edge in this species and its near allies. The elytra are almost precisely similar in form to those of *C. angusticollis*, but they are slightly broader at the base; they are covered with rather inconspicuous, closely crowded striæ, almost exactly as in the recent species mentioned, but even more closely crowded, numbering about twenty-five, including the frequent lines bordering the margin, which is simple and striate to the very edge, or, possibly, faintly marginate, as in some *Carabi*, but differing conspicuously from the species of *Cychrus* to which I have compared it. The form of the tip of the elytra is also exactly as in this species. The interspaces of the elytra do not exhibit the imbricated appearance common to most of the *Carabini*, but the surface has more of the nearly imperceptible waviness seen in *C. angusticollis*, although, if anything, the surface is less broken.

Length of elytron 7.5^{mm}; greatest breadth (behind the middle) 2.6^{mm}.

Platynus senex.—This species is represented by a single specimen and its reverse (Nos. 3998, 3992). The upper surface is shown with none of the slenderer appendages. The true form of the head cannot be determined, as the edges are not preserved. The prothorax is unusually square for a Carabid, resembling only certain forms of *Bembidium* and *Platynus*, and especially *P. variolatus* LeC. It is, however, still more quadrate than in that species, and differs from it in shape, being a little broader than long, broadest just behind the middle, tapering but little anteriorly, and scarcely more rapidily at the extreme apex; the elytra are together only about half as broad again at base as the thorax, and are furnished with eight very faint and feeble striæ, apparently unpunctured, the one next the margin interrupted by four or five foveæ on the posterior half of the elytra; the humeral region is too poorly preserved to determine the striæ at that point; the form of the elytra is as in *P. variolatus*.

Length of body 6.1^{mm}; breadth of thorax 1.5^{mm}, of base of elytra together 2.3^{mm}; length of elytra 4.1^{mm}.

HYDROPHILIDÆ.

Tropisternus saxialis.—One specimen and its reverse (Nos. 4023, 4027), found by me in the Green River shales, represent a species of *Tropisternus* nearly as large as *T. binotatus* Walk. from Mexico. The large size of the head and the shortness of the prothorax are doubtless due to the mode of perservation, the whole of the head, deflected in life, being shown, while the thorax is in some way foreshortened. In all other respects, it agrees with the *Hydrophilidæ*, and especially with *Tropisternus*, having the form of the species mentioned. The head is broad and well rounded, with small, lateral, posterior eyes. The thorax is much broader and much more than twice as broad as long, with rounded sides, tapering anteriorly, the front margin broadly and rather deeply concave, the hind border gently convex; the scutellum is large, triangular, a little longer than broad. The surface of the thorax and elytra is apparently smooth; at least, no markings are discoverable, excepting the line of the inner edge of the inferior margination of the sides of the elytra, which appears through the latter, as do also the abdominal incisures and the hind femora and tibiæ. These legs are longer and slenderer than in *T. binotatus*, the femora extending beyond the sides of the abdomen, and the tibiæ are armed beneath at tip with a pair of slender spines, which together with the tibiæ are about as long as the femora.

Length of body 6.65^{mm}, of elytra 4.45^{mm}; breadth of middle of body 3.25^{mm}; length of hind femora 2^{mm}, of hind tibiæ 1.25^{mm}.

Tropisternus sculptilis.—In a specimen (No. 3989) of which only the abdomen and elytra are preserved, we have a well-marked species of *Tropisternus* of about the size and shape of *T. mexicanus* Castln., but with rather frequent striæ, more distinct than in that species, and composed, not, as there, of rows of impressed points, but of continuous, faintly impressed lines; the lines are apparently eight in number and uniform in delicacy and distance apart; the base of the elytra, however, is poorly preserved; the elytra are rather slenderer than in the recent species mentioned, and the extreme tip is rounded and not acutely pointed. Distinct striation of the elytra is rare in *Tropisternus*, but it scarcely seems possible to refer this species elsewhere.

Length of elytra 6.5^{mm}; breadth of combined elytra 5^{mm}.

Berosus tenuis.—The single specimen (No. 4002) representing this species is preserved on a dorsal view, and is unusually slender for a *Berosus*, but seems to fall here rather than in any other of the Hydrophilid genera. It is of about the size of *B. cuspidatus* Chevr. from Mexico, and agrees generally in appearance with it, but is slenderer, and the tip of the elytra is simple; the punctured striæ are exactly as in that species, as far as they can be made out. The head is large and well rounded, with large, round eyes. The pronotum, the posterior edge of which is partly concealed by the overlapping base of the elytra, pushed a little out of place, is shorter than in *B. cuspidatus*, with rounded sides, broadly and shallowly concave front, and apparently smooth surface. The elytra are long and slender, with entire, bluntly pointed tips, and very delicate, finely impunctured striæ. The whole body is regularly obovate, broadest in the middle.

Length of body 5.65^{mm}, of elytra 4.15^{mm}; breadth of body 2.75^{mm}.

Berosus sexstriatus.—A single well-preserved elytron (No. 4079) represents a species scarcely smaller than *B. punctipennis* Chevr. (undescr.) from Mexico, with the elytra of which it also agrees in the character of the tip and in the shape of the whole, unless in the fossil it tapers more toward the base; the latter is also remarkable for the absence of the two lateral striæ, the others retaining their normal position; for the delicacy of the striæ themselves, which are even more faintly impressed than in

B. cuspidatus Chevr., and, unlike all *Berosi* I have seen, are nearly devoid of any sign of punctuation; faint traces only can be seen when magnified twenty-five diameters. As not unfrequently happens in *Hydrophilidæ*, although I have not noticed it in *Berosus*, a short supplementary stria originates near the base of the second stria, pushing it a little to one side, and runs into the first stria a short distance from the base of the elytra.

Length of elytron 4.5^{mm}; breadth 1.4^{mm}.

Laccobius elongatus.—A single specimen and its reverse (Nos. 81^{a}, 136^{g}), collected by Mr. Richardson, but overlooked in my former paper on the Coleoptera of the Rocky Mountain Tertiaries,[*] exhibit the elytron of a slender species of *Laccobius*. It is more than two and a half times longer than broad, and is furnished with thirteen equidistant, delicately punctured, faintly impressed striæ, the punctures of which are more apparent on the basal than on the apical half; the inner stria is as distant from the sutural border as from the neighboring stria, while the outer is scarcely separate from the outer margin. The species is very large, and also very slender, for a *Laccobius*, in which genus, however, I am inclined to place it, from the large number of punctured striæ. The elytron has much the general appearance of that of a *Lebia*, but the number of striæ, of course, forbids such a reference.

Length of elytron 2.9^{mm}; breadth 1.1^{mm}.

Philhydrus primævus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 78.—A single specimen, found by Mr. Richardson.

Philhydrus spp.—Two specimens (Nos. 4033, 4042) of a second species of *Philhydrus* were found by Mr. Bowditch and myself, but neither of them very perfect, representing little else than elytra, and these rather obscurely preserved. The larger species has smooth elytra; the elytra of the other have eight delicate striæ, which apparently are not punctured. Possibly one or both should be referred to *Hydrobius*.

Length of elytra of larger species (No. 4033) 4^{mm}; breadth of body 3.2^{mm}.

Length of elytra of smaller species (No. 4042) 3.75^{mm}; breadth of body 3^{mm}.

Hydrobius decineratus.—A single specimen (No. 4007) exhibits the dorsal surface, but with part of the thorax gone. It represents a species a very little larger than *H. fuscipes* Curt. of California, and is apparently allied to it, though slenderer; the head and eyes are as in that species; the thorax shorter and the elytra longer, and more tapering at the tips, the extremities of which, however, are not preserved; they are furnished with eight delicate striæ, in which the punctures are scarcely perceptible, even when magnified; the surface otherwise appears to be smooth, but is not well preserved. The scutellum is as in the recent species mentioned.

Length of body 7.5^{mm}, of elytra 4.75^{mm}; breadth of body 3.6^{mm}.

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[*] Bulletin of this Survey, ii, No. 1, 77–87.

STAPHYLINIDÆ.

Lathrobium abscessum Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 79.—Two specimens were found by Mr. Richardson, and since the description of the species three others by myself at the same locality.

Bledius adamus.—A rather poorly preserved specimen (No. 4081) shows the dorsal view of the body without the legs or antennæ. It is of about the size of *B. annularis* LeC., and resembles it in general appearance, but seems to have shorter tegmina, although these are obscure; it is also a rather slenderer species. The head is large, as broad as the thorax, with rather large eyes. The thorax is quadrate, and the elytra together quadrate, and of the same size as the thorax. The abdomen beyond the elytra is as long as the rest of the body; apically it expands somewhat, and the extremity is shaped as in the species mentioned.

Length of body 4.4^{mm}; breadth of thorax 0.75^{mm}.

Staphylinites obsoletum Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 78.—A single specimen found by Mr. Richardson.

NITIDULIDÆ.

Phenolia incapax Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 80.—One specimen and its reverse, found by Mr. Richardson.

CRYPTOPHAGIDÆ.

Antherophagus priscus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 79–80.—Several specimens, found by Mr. Richardson, Mr. Bowditch, and myself.

ELATERIDÆ.

Corymbites velatus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 81.—Found by Mr. Richardson.

PTINIDÆ.

Sitodrepa defuncta Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 82.—A single elytron and its reverse, found by Mr. Richardson.

Anobium? ovale.—A single specimen (No. 4038) exhibits the upper surface of the pronotum and elytra. The insect evidently appertains to a distinct genus of *Ptinidæ*, in which the sides of the body are not parallel, but the body tapers posteriorly much, though not to the same extent, as anteriorly. It is, however, most nearly allied to *Anobium*, in which it is provisionally placed. It is about as large as *Endecatomus rugosus* LeC. The prothorax, viewed from above, is bluntly conical, tapering rapidly. The body is broadest just behind the base of the elytra, and tapers slightly at first, more rapidly afterward, and is rounded posteriorly; thus the whole body has an ovate outline. The pronotum is minutely and very profusely punctulate in black, and appears to have been covered profusely with slight asperities or a coarse pile (much perhaps as in *Endecatomus rugosus*). The elytra, which are nearly three times as long as broad, and taper regularly from near the base to near the tip, show no mark of such asperities, but are profusely punctate in black, made up of scattered punctæ, about 0.03^{mm} in diameter, not altogether irregularly disposed, although at first sight having that appearance, but showing in many places, not uniformly, signs of a longitudinal distribution into from fourteen to sixteen rows. The elytra, indeed, resemble those of *Bostrychus capucinus* (Linn.), but I am not aware that similar markings occur on smaller *Ptinidæ*.

Length of body 4.3^{mm}; breadth of same 2^{mm}; length of elytra 3.15^{mm}.

Anobium ? deceptum.—Another specimen (No. 4086), representing an elytron only, evidently belongs to the same genus as the last, and at first sight appeared to be of the same species, as it belongs to an insect of the same size, and the punctures on the elytra are similarly disposed; they are, however, if anything, more thickly crowded, so as to form about eighteen rows in the rather broader elytron; and not only is the elytron broader and shorter than in the preceding species, being less than two and a half times longer than broad, but it scarcely tapers at all in the basal three-fifths, and beyond that more rapidly than in the species last described.

Length of elytron 3^{mm}; breadth of same 1.25^{mm}.

Anobium lignitum.—A third species of this family, with irregularly punctate elytra, is represented by a single specimen (No. 4082), giving a dorsal view of pronotum and elytra. It differs generically from the two preceding species, and agrees better with *Anobium* proper in having a more gibbous and less conical prothorax, and in having the sides of the elytra parallel through most of their extent. It is considerably smaller than either of the preceding species. The prothorax is one-third the length of the body, minutely punctate and scabrous, tapering only a little in its basal and considerably in its anterior half, the front well rounded. The elytra are about two and a half times longer than broad, equal on the basal two-thirds, and then rounding rapidly inward, so that the posterior outline of the body is more broadly rounded than the anterior outline; the elytra are profusely punctate with little pits, averaging scarcely more than 0.02^{mm} in diameter, distributed at pretty regular intervals, but not forming anything like longitudinal series, and so near together as to be equivalent to about fourteen rows. The whole body is uniformly black.

Length of body 3.75^{mm}, of elytra 2.5^{mm}; width of body 1.9^{mm}.

EROTYLIDÆ.

Mycotretus binotata.—A single specimen with its reverse (Nos. 3990, 4015) represent the dorsal aspect of this species, which closely resembles *M. sanguinipennis* Lac. in shape. It is, however, a little smaller, the thorax tapers less rapidly, and the elytra are not striate. The head is badly preserved, being crowded under the thorax; it appears, however, to be very small, about half as broad as the thorax, with a broadly rounded front, large eyes, and a dark color. The thorax is about two and a half times broader than long, with slightly convex sides, regularly tapering toward the apex, but not so rapidly as would seem to be required for so proportionally narrow a head; the front border broadly concave, the hind border very obtusely angulate, scarcely produced as a broad triangle in the middle; the surface is of a light color, very minutely and profusely punctulate, the hind borders faintly marginate, the margin black and punctate. The elytra are more elongate than, and do not taper so rapidly as, in *M. sanguinipennis*; they are of the color of the thorax, even more delicately punctulate than it, with two small, short, black, longitudinal, impressed dashes just outside the middle, and just before the end of the basal third; the basal edge of the elytra is marked in black, much as the posterior border of the pronotum; and the scutellum is small, owing to the encroachment of the median prolongation of the prothorax.

Total length 3.5^{mm}; length of thorax 0.6^{mm}, of elytra 2.5^{mm}; breadth of head 0.75^{mm}, of thorax in front 1.2^{mm}, behind 1.45^{mm}, of elytra at the spots 2.1^{mm}.

CHRYSOMELIDÆ.

Cryptocephalus vetustus.—This species is fairly represented by a pair of specimens with their reverses (Nos. 4003, 4004; 4039, 4044). One pair exhibits the front, and, by the drooping of the abdomen, the under surface of the insect with expanded elytra (one of them curiously foreshortened), the other the under surface only. The insect is broadly oval, and, except in being much stouter, closely resembles *C. venustus* Fabr., with which it agrees in size. The thorax, as seen on a front view, is arched, and the proportion of the head to the thorax is as in the recent species mentioned. The elytra, which are the part best preserved, are rounded at the extremity, and are furnished with ten slightly arcuate rows of gentle punctures, arranged inconspicuously in pairs, besides a sutural, slightly oblique row on the basal third of the elytra, terminating in the margin. This disposition of the punctures and the character of the head, sunken, as it were, into the thoracic mass, leave little doubt that the insect should be referred to *Cryptocephalus*. The elytra are of a uniform light horn-color, but the body is darker. The body is more oval than in the parallel-sided *C. venustus*.

Length of body 4–4.5^{mm}; breadth of same 2.6–3.2^{mm}; length of elytra 4^{mm}; breadth of one of them 1.8^{mm}.

RHYNCHITIDÆ.

Eugnamptus decemsatus.—A single elytron (No. 4046) with a broken base is all that remains of this species. But this is peculiar on account of the supplementary humeral stria, which seems to be common in the *Rhyn-*

chitidæ, and at least very rare in the allogastral *Rhyncophora*, to which one would at first glance refer this fragment. So far as the material at hand permits determination, it appears to agree best with the genus to which it is referred, on account of the disposition of the punctuation and the form of the tip of the elytron. It represents, however, a very large species, and one whose punctuation is very delicate. The elytron is long and rather narrow, indicating an elongated form for the body, as in this genus, with parallel sides and a bluntly rounded tip. There are ten complete equidistant rows of delicate, lightly impressed punctures, those of the same row less distant than the width of the interspaces; the outer row lies close to the outer border and is seated in an impressed stria, as also is the apical half of the inner row; but the other rows show no such connection between the punctures which compose them; at the base the rows curve very slightly outward to make place for a very short humeral row of punctures, parallel to the inner complete row, and composed of only three or four punctures on the part preserved; the interspaces are smooth.

Length of fragment 4.5mm; width of elytron 1.5mm.

OTIORHYNCHIDÆ.

Epicærus saxatilis Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 84–85 (*Eudiagogus*).—Twenty-seven specimens of this species have been found by Mr. Richardson, Mr. Bowditch, and myself. This and the two following species cannot be referred to *Eudiagogus* on account of the length of the snout. Although very small for *Epicæri* (especially the present species), they agree so well with *Epicærus griseus* Schönh. from Mexico—one of the smallest of the group—that they would best be referred here, although they differ from this genus in the brevity and stoutness of the femora, all of which are swollen apically. It is possible that all three of the forms mentioned here should be referred to a single species, as there is certainly very little difference between them excepting in size; this is particularly the case with this and the next species. Together over one hundred of these species have been examined by me; they are, therefore, the most abundant fossils of the insect beds of the Green River shales.

Epicærus effossus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 85–86 (*Eudiagogus*).—Nearly fifty specimens of this species are at hand, all found in Richardson's shales by Mr. Richardson, Mr. Bowditch, and myself, besides two I found in beds at the same spot, but about thirty metres lower; these were the only *Coleoptera* found at that spot, excepting a single specimen of *Otiorhynchus dubius* Scudd., belonging to the same family.

Epicærus exanimis Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 58 (*Eudiagogus*).—Thirty-one specimens of this species have been examined.

Ophryastes compactus.—A single specimen (No. 4210), preserved so as to show a lateral view of the insect, appears to indicate an Otiorhynchid allied to *Ophryastes*. The form of the elytra, indeed, does not well correspond, since, in place of their abrupt posterior descent, as seen in *O. cinereus* Schönh. from Mexico, with which it agrees best in general features as also in size, they slope very gradually, and appear to be tumid next the base. But the structure of the stout snout, enlarged apically, with very oblique descending antennal scrobes, the superior transverse furrow at its base giving an increased convexity to the vertex of the head, ally it closely to *Ophryastes*. The ovate eye is longitudinal, the front border of the pronotum nearly straight with no advance of the sides, the prothorax itself faintly rugulose, the elytra coarsely striate, the striæ with feeble, rather distant punctures (the reverse is shown on the stone); the tips of the elytra are right-angled or slightly produced at the extremity, as in recent species.

Length of body, measured from base of rostrum, 7.5^{mm}; height of same 3.5^{mm}; length of elytra 5.5^{mm}, of rostrum beyond front of eyes 1.2^{mm}; breadth of rostrum at base 0.9^{mm}, where largest 1.05^{mm}; length of eye 0.5^{mm}; breadth of same 0.3^{mm}; distance apart of the elytral striæ 0.35^{mm}.

Otiorhynchus perditus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 84.—A single specimen was found by Mr. Richardson; another, found by myself, is doubtfully referred here, but is so fragmentary as to add nothing to the characters already given.

Otiorhynchus dubius.—A cast of an elytron (No. 4204) resembles so closely the elytron of the preceding species, excepting in size, that it is referred to the same genus. Only nine striæ can be counted, but all of those at the outer side may not be seen; the inner stria is very close to the margin, and indeed is lost in it both above and below, but this may be due simply to the preservation. The stone in which they are preserved is coarser than usual, coming from beds about thirty metres directly below the shales which have furnished the other insect remains, and has a greater admixture of sand; consequently the character of the surface of the elytra cannot be determined, but the striæ are sharp and narrow, and filled with longitudinal punctures. With the exception of a couple of poor specimens of *Epicærus effossus* Scudd., this was the only recognizable insect found at this locality.

Length of elytron 4^{mm}; breadth of same 1.5^{mm}.

Eudiagogus terrosus.—This species, which seems more properly referable to *Eudiagogus* than those formerly so named by me, is represented by a single specimen and its reverse (Nos. 4024, 4078), preserved on a side view. The snout is short, as long as the eyes, scarcely so long as the head, and stout; the eyes transverse, rather large, subreniform. The thorax appears to be smooth, like the head, deep and short, its front border extending forward on the sides toward the lower part of the eye. The elytra, the lower surface of which does not appear to be in view, are broad and long, rectangular at tip, furnished with more than eight rows of frequent, rounded, moderately large and shallow punctures, and between each pair of rows a similar row with smaller punctures.

Length of body 6^{mm}, of elytra 4.55^{mm}, of eyes 0.5^{mm}.

CURCULIONIDÆ.

Sitones grandævus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 83–84.—A single specimen, found by Mr. Richardson.

Hylobius provectus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 86.—A single specimen was found by Mr. Richardson. Another specimen (No. 4051), taken by Mr. Bowditch at the same locality, shows the character of the rostrum. The specimen is strangely preserved, as there appears to be a second rostrum, a perfect counterpart of the first, attached to it at the tip; perhaps this belongs to another individual, of which the rostrum only is preserved. The rostrum is about as long as the thorax, scarcely tapering as viewed laterally, gently curved, with a median, lateral, longitudinal groove, directed toward the middle of the eye, just as in *H. confusus* Kirb., besides the antennal scrobes, which are directed obliquely toward its base.

Gymnetron LeContei.—A single well-preserved specimen, with its reverse (Nos. 4030, 4047), lies in such a position as to show a partly lateral and partly dorsal view; the legs are also preserved, so that it is the most perfect of the Green River *Coleoptera.* The small head, long and slender, straight, and drooping snout, the tapering thorax, broad and short striate elytra, thickened femora, and long and slender tibiæ leave little doubt that it should be referred to *Gymnetron* or to its immediate vicinity. It is very nearly as large as *G. teter* Schönh., with which it closely agrees in almost every part. The third tarsal joint is similarly expanded. The real length of the rostrum cannot be determined from the position of the insect, but it is apparently as long as the head and thorax together, is very nearly straight, slender, scarcely enlarged, and obliquely docked at the tip; only a portion of the antennal scrobes can be seen; this is in the middle of the beak, where the groove is narrow, deep, sharply defined, and inclined slightly downward toward the base of the beak. The thorax is subrugulose, and the surface of the elytra smooth, with distinct, but not deeply impressed, very faintly punctured striæ. The whole specimen is piceous.

Length of body 3.15^{mm}, of snout 1^{mm}?, of head and thorax 0.9^{mm}, of thorax 0.75^{mm}, of elytra 2.25^{mm}, of hind tibiæ 1.5^{mm}; distance apart of elytral striæ 0.1^{mm}.

Cryptorhynchus annosus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 86–87.—A single specimen, found by Mr. Richardson.

SCOLYTIDÆ.

Dryocœtes impressus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 83 (*Trypodendron*).—Mr. Richardson obtained a single specimen, upon which the original description was based. Several additional specimens (Nos. 4009, 4048, 4091) were obtained by Mr. Bowditch and myself, and these help to show that the insect would better be referred to *Dryocœtes* than to *Trypodendron* (=*Xyloterus* of LeConte's recent monograph). The species is of about the size of *D. septentrionalis* (Mann.), but has more of the markings of *D. affaber* (Mann.), although the punctuation of the elytra is not so distinctly separable into longitudinal series.

Dryocœtes carbonarius.—Another species, not very closely allied to the last, is represented by a single, rather mutilated specimen (No. 3999), which is pitchy-black, and consists of part of the head, thorax, and elytra. The head is rather long, faintly and not very closely punctured, the eye moderately large and circular. The thorax is proportionally longer than in the preceding species; the front margin recedes a little on the sides, and the surface is subrugose by subconfluent punctures, the walls of which form wavy ridges having a longitudinal direction. The elytra are broken at the tip; their outer anterior angle is obliquely excised, and the outer margin behind it straight, not sinuate, as in the preceding species; the surface is rather coarsely, but very faintly granulate, more distinctly next the base, but even here very vaguely; and there are faint indications of three or four distant, simple, longitudinal striæ.

Length of the fragment as curved 4^{mm}, of head 1.1^{mm}?, of thorax 1.3^{mm}; probable length of elytra 3.15^{mm}; width of same 1.5^{mm}; diameter of eye 0.35^{mm}.

ANTHRIBIDÆ.

Cratoparis repertus.—A single specimen (No. 4035) shows the fragment of an elytron, which is referred to this genus from the character of the punctuation and the arrangement of the striæ. It closely resembles *C. lunatus* Fahr. in these points, but must have belonged to a slenderer insect, about as large as *C. lugubris* Fahr. There are eleven striæ or rows of pretty large, subconfluent, short, longitudinal dashes or oval punctures, deeply impressed, the outer of which follows the extreme margin, excepting apically; the inner stria also runs very near the border; the interspaces between the first and second and between the second and third striæ are equal, and a little broader than the interspaces between the other striæ; the inner margin is delicately grooved next the base, as in *C. confusus*.

Length of fragment 4.3^{mm}; width of elytra 1.6^{mm}; width of interspace between second and third striæ 0.21^{mm}, between third and fourth striæ 0.13^{mm}.

Cratoparis? elusus.—To this I refer doubtfully two specimens (Nos. 4012, 4060), neither of them very perfect, which appear to belong together, and to represent an insect allied at least to *Cratoparis*, and of about the size of *C. lunatus* Fahr. It appears to have a short rostrum, a moderately small, but rather tumid head, with circular eyes; thorax not greatly attenuated anteriorly, but profusely punctate, with moderately large and rather shallow punctures; elytra arched, nearly three times longer than the thorax when measured over the curved back, furnished with slight and faintly impunctured striæ; the surface between the striæ also punctured, but very faintly.

Length of body 7.5^{mm}, of thorax 2.25^{mm}, of elytra 5.5^{mm}.

Brachytarsus pristinus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 87.—A single specimen, obtained by Mr. Richardson.

HEMIPTERA.

(HETEROPTERA.)

PENTATOMIDÆ.

(CYDNINA.)

Cyrtomenus concinnus.—This species is represented by a single specimen (No. 4190), a little smaller than *C. mutabilis* (Perty), but closely resembling it in general form. It is broadly ovate; the head large, prominent, well rounded, nearly half the eyes protruding beyond the margin, the ocelli nearly one-fourth the diameter of the eyes, and situated next the hind border, very nearly half-way between the inner margin of the eyes and the middle line of the head. Thorax twice as broad as the head, exclusive of the projecting part of the eye, more than twice as broad as long, the front margin rather deeply and regularly concave, the sides considerably convex, especially on the front half, the hind margin very broadly convex. Scutellum longer than the thorax, scarcely less tapering on the apical than on the basal half, the apex rounded, half as broad as the base, the whole about as long as the breadth at base. Tegmina very faint, but the corium apparently terminating just before the tip of the scutellum. Extremity of the abdomen very broadly rounded. The whole surface of the head, thorax, scutellum, and probably of the corium, uniformly very profusely and minutely punctulate; otherwise smooth, excepting that there are also faint traces of a slight, transverse, median depression, and a similar longitudinal median depression on the thorax.

Length of body 5.25^{mm}, of head 1.2^{mm}, of thorax 1.3^{mm}, of scutellum 1.65^{mm}; breadth of head 2^{mm}, of thorax 3.5^{mm}; diameter of eye 0.25^{mm}.

Aethus punctulatus.—Five specimens of this species were found (Nos. 19^{d}, 67^{c}, 74^{a}, 172, and 4193). Body of nearly equal breadth throughout, the sides of the abdomen a little fuller. Head rounded, small, the part behind the eyes rounded, as deep as the portion in front of them; front, as seen from above, well rounded, well advanced, subangulate; eyes moderately large; ocelli large, situated close to, a little behind, and within the eyes, and about one-third their diameter; surface of head minutely and obscurely granulate. Thorax nearly equal, slightly broadening posteriorly, the anterior angles well rounded, the front border very deeply and roundly excised, the hind border nearly straight; the whole fully twice as broad as the head, and twice as broad as long. Scutellum obscure, but apparently of about equal length and breadth, and regularly triangular. Abdomen well rounded, half as long again as broad. Tegmina obscure or lost in all the specimens seen. Thorax and scutellum minutely granulate, like the head. Posterior half, at least, of the abdomen profusely covered with shallow punctures.

Length of body 3.75^{mm}, of head 0.6^{mm}, of middle of thorax 0.75^{mm}; breadth of head 0.8^{mm}, of thorax 1.8^{mm}, of abdomen 2.25^{mm}.

Cydnus ? mamillanus.—An obscure specimen (No. 39) is of doubtful generic relations, but evidently belongs to the *Cydnidæ*. The body is broad and convex in front, with a rapidly tapering abdomen, scarcely at all rounded, even at the tip. The head, as seen from above, is nearly circular, shaped much as in *Aethus punctulatus*, but more broadly and regularly rounded in front, with the central lobe broad, and defined by rather strongly impressed furrows; the ocelli are large, situated just behind the anterior extension of the thoracic lobes; the surface of the head is rugulose. Thorax more than twice as broad as the head, and more than half as long again; the sides rounded, being broadest at the posterior border, narrowing in front and roundly excised at the anterior angles; front border very deeply hollowed behind the head, leaving prominent front lobes on either side, nearly as large as the head, and strongly mamillate; hind border nearly straight. The surface is minutely granulate; besides which there is a transverse belt of rather large and distant punctures midway between the mamillations and the hind border. The scutellum is very large, rounded-triangular, broader than long, and granulate like the thorax. Corium of tegmina, which occupies their greater portion, obscurely and distantly punctulate; abdomen triangular, the apex bluntly pointed.

Length of body 4^{mm}, of head 0.8^{mm}, of either lateral half of thorax 1.35^{mm}; breadth of head, 1^{mm}, of thorax, 2.4^{mm}.

LYGÆIDÆ.

(MYODOCHINA.)

Rhyparochromus ? terreus.—A single poor specimen (No. 4192) apparently belongs to this subfamily, but is too imperfect to locate with any precision. The body is of nearly equal width, but with a full abdomen. The head is broken, but is as broad at base as the tip of the thorax, has a rounded-angular front, and its surface most minutely punctulate. The thorax was broadest behind, the sides tapering slightly, and gently convex, the front border broadly and shallowly concave, the hind border straight, more than twice as broad as the median length, the surface, like that of the head, with faint distant punctures. Scutellum rather small, triangular, pointed, of equal length and breadth, about as long as the thorax, its surface like that of the thorax, but with more distinct punctures. Abdomen full, well rounded, and very regular. Tegmina obscure (but perhaps extending only a little beyond the scutellum).

Length of body 4^{mm}, of head 0.6^{mm}, of thorax 0.6^{mm}, of scutellum 0.7^{mm}; breadth of head 1.1^{mm}, of thorax 1.5^{mm}, of abdomen 2.1^{mm}.

REDUVIIDÆ.

(REDUVIINA.)

Reduvius ? guttatus.—Two specimens of this species have been found, one with reverses (No. 9^a, 96^b), by Mr. Richardson, the other (No. 4070) by myself. Mr. Richardson's specimens are very obscure and distorted, and without the aid of the other could not have been determined. The insect probably belongs to the genus *Reduvius* (*sens. str.*), or at all events falls in its immediate vicinity. The body has much the form of the common *R. personatus* Linn., of Europe, but is proportionally shorter. All parts are rather obscure, but the head evidently tapers and is roundly pointed in front, the thorax narrows gently from behind forward and is nearly as long as broad; the scutellum is rather small, triangular, the apex bent at a right angle and rounded. The abdomen is ovate, twice as long as broad. The species is marked with round, dark spots, about 0.2^{mm} in diameter, on either side, one at the outer edge of the front of each abdominal segment, and one in the middle of either transverse half of the thorax, a little removed from the outer border; the anterior ones half-way between the border and the middle line. The whole surface appears to be very minutely granulated. The tegmina cannot be seen.

Length of body 5.5^{mm}; breadth of thorax 1.4^{mm}, of abdomen 1.65^{mm}.

[HOMOPTERA.]

JASSIDÆ.

Acocephalus Adæ.—Two specimens (Nos. 72, 100) represent the body of apparently a species of *Acocephalus*. The head projects forward in a triangular form, is rounded at the extreme apex, a little broader than long, and nearly twice as broad between the small eyes as its length in advance of them. The body is slender, the abdomen slightly tapering, rounded at the apex. The tegmina extend a short distance beyond the body with parallel longitudinal veins.

Length of body 5.25^{mm}; breadth of head 1.4^{mm}, of middle of abdomen 1.3^{mm}.

FULGORIDÆ.

(FULGORIDA.)

Fulgora ? granulosa.—A single specimen and its reverse (Nos. 49, 131) show only the thorax and abdomen of an insect belonging to the subfamily of *Fulgorida*, but of which little more can be said. The thorax is large, globose, and black; the scutellum is about half as large as the thorax, longer than broad, and rounded at the apex; the abdomen tapers gently, its apex about half as broad as its base, and is provided with a pair of overlapping, black, roundish, oval plates, giving the appearance of an additional segment. The surface of the thorax and abdomen is thickly and uniformly granulate with circular, dark-edged elevations, averaging 0.04^{mm} in diameter; the scutellum lacks this marking, excepting at the edges, which are more minutely and profusely granulate.

Length of body 8.5^{mm}, of thorax 2.75^{mm}, of scutellum 1.4^{mm}, of appendages 1^{mm}; breadth of thorax 2.5^{mm}, of scutellum 1.25^{mm}, of second segment of abdomen 2.2^{mm}.

Aphana rotundipennis.—This name is proposed for a single broken wing of an Homopteron (No. 175), with which another wing (No. 4187), still more imperfect, appears to agree; and which seem by their obscure venation to belong in the same group as the White River fossil which I have called *Aphana atava.* It differs, however, in having a strongly bowed costa, which is curved more apically than near the base, and continues very regularly the curve of the well-rounded apex; the commissural border is perfectly straight; the principal veins fork near the base, so that there are a number of longitudinal veins a short distance therefrom; no transverse veins are discernible, nor oblique veins at the costal margin, but the longitudinal veins all fork at a similar distance from the apex, so that the apical fifth of the wing is filled with still more numerous longitudinal veins; the tegmina are broadest just beyond the middle.

Length of tegmina 6.75^{mm}; breadth of same 3^{mm}.

Lystra ? Richardsoni.—I have before me a number of specimens (Nos. 67, 119, 4076, 4207, 4208, 4212, 4217) of a large Fulgorid, apparently belonging near *Lystra* and *Pœocera*, but which have only been preserved in a fragmentary condition. Enough, however, remains to show several features; the vertex between the eyes is half as broad again as the eyes, and at least as long as broad, projecting beyond the eyes by more than the diameter of the latter, and well rounded. The scutellum is large, fully as long as broad. The longitudinal veins of the tegmina are rather infrequent, forking rarely, and even toward the apex seldom connected by cross-veins; apparently, all the principal veins branch at about the same points, viz, near the middle of the basal and of the apical half; the tegmina somewhat surpass the abdomen. The body is broadest at the second or the third abdominal segment, and tapers rapidly to a point, the segments being equal in length.

Length of body 16^{mm}; probable length of tegmina 15.5^{mm}; breadth of abdomen 5.5^{mm}.

(CIXIINA.)

Cixius ? hesperidum.—A single fragment (No. 38), representing a nearly perfect tegmen, with obscure venation, is probably to be referred to *Cix*-

ius, but is unsatisfactory; the costal border is gently and regularly convex, the tip well rounded, with no projecting apex; the tegmen appears to increase very slightly in size to a little beyond the middle, up to which point the borders are nearly parallel; the course and branching of the nervures, so far as they can be made out, seem to indicate an insect allied to *Cixius*, but no cross-veins can be seen.

Length of tegmen 6.2^{mm}; its greatest breadth 2.5^{mm}.

Mnemosyne terrentula.—A single specimen (No. 31^{d}) is preserved, with an indistinct body, broken in front, and the greater part of one of the tegmina, which show it to be very closely related to, if not a member of, this genus. The body is moderately broad, ovate, the tip of the abdomen rounded and slightly produced. The tegmina are regularly enlarged toward the apex and rounded at the extremity, not at all truncate; the interior branch of the radial vein forks near the middle of the wing, and just beyond the first subapical transverse vein; both its branches fork before they have passed more than half-way to the marginal row of elongate cells.

Estimated length of body 6.5^{mm}, breadth of same 2.25^{mm}; length of tegmina 7^{mm}, breadth of same 2.25^{mm}, their extent beyond the abdomen 2.2^{mm}.

(TROPIDUCHIDA.)

Lithopsis (λίθος, ὄψις), nov. gen.

Body oblong, stout, and apparently cylindrical anteriorly, tapering and probably compressed posteriorly. Head broad and short, the front not produced beyond the eyes, broad, transverse, very gently convex. The united thorax and scutellum of about equal length and breadth. Tegmina surpassing considerably the tip of the abdomen, two or three times as long as broad, beyond the middle barely tapering, the sides subequal, the tip obliquely subtruncate, the apex rounded, the costal margin gently convex; margino-costal area broad, broadening regularly toward the apex, and throughout its length traversed by very frequent transverse veinlets, which become more and more oblique toward the apex of the tegmina, where they are supplanted by the similarly close branches of the longitudinal veins; these are united at the origin of the forks by transverse veins in continuity with the costa itself. The radial vein is branched at the base of the tegmina, the inner ulnar vein at some distance before the middle of the wing; and both branches of this vein, and the lower branch of the radial, fork again at half the distance from the first fork of the inner ulnar vein to the tip of the wing, but they are not connected at this point by transverse veins. Wings as long as the tegmina.

This genus seems to belong nearest the South American genus *Alcestis* Stål, but differs decidedly from it in the form of the tegmina, the absence of oblique inferior ramuli to the inner ulnar vein, and the structure of the head.

Lithopsis fimbriata.—A tolerably well-preserved specimen, with its reverse (Nos. 4185, 4189), together with the fragment of a wing (No. 143^e,) are the basis for this species. The vertex between the eyes is more than twice the width of the eyes, and is marked by a slight, median, longitudinal carina; the front of the vertex is nearly straight, does not protrude beyond the eyes, but is retracted next them, making it very broadly convex. The thorax is considerably broader than the head, but the condition of the specimens does not allow a more definite statement. The tegmina are the best-preserved remains of the animal, being perfect, although somewhat obscure, partly from the veins of the underlying wings; they are more than two and a half times longer than broad, the costal margin, especially its basal half, moderately curved, the commissural margin almost perfectly straight, the apex slightly and obliquely truncate, so as to throw its well-rounded apex below the middle; near its extremity the margino-costal field occupies more than a third of the breadth of the tegmina, being double its width near the base; the first branching of the inner ulnar vein is as far from the apex of the tegmina as the second branching is from the base; and the third branching, where, and where only, the longitudinal veins are united by cross-nervures, is midway between the second branching and the apex; close to the apical margin there is an inconspicuous fourth series of furcations.

Length of body 9^{mm}, of tegmina 9.75^{mm}; breadth of the same in the middle 3.65^{mm}, next the third branching of the longitudinal veins 3.25^{mm}.

ORTHOPTERA.

GRYLLIDES.

Nemobius tertiarius.—Two specimens (Nos. 18, 20) represent the hind femora (and No. 18 also the hind tibia and a femur and tibia of the front leg) of a small cricket. The insect must have been rather smaller than our common *N. vittatus* (Harr.), its hind femur being 7^{mm} long, broad and stout, especially near the base, where it measures 2.1^{mm}; its upper half is covered with exceedingly delicate, recumbent hairs, directed backward; there are also a few hairs upon the slender hind tibia, which is broken just where it begins to enlarge, showing signs of the upper spines; this portion is about three-fourths the length of the femur. The front femur and tibia, which are each only 2.25^{mm} long, also indicate a small species and one that is unusually free from spines, no hairs even being discernible on this front leg.

LOCUSTARIÆ.

The only other remains of *Orthoptera* noticed in the Green River shales is a tibia and fragment of the attached femur (No. 2) of what is apparently the middle leg of a Locustarian about the size of a *Phylloptera*.

NEUROPTERA.

ODONATA.

(LIBELLULINA.)

Fragments of an abdomen in obverse and reverse (Nos. 4175, 4176) are probably to be referred to a species of *Libellulina*, but they are insufficient to give further determination. They evidently represent four or five of the terminal segments of the body, there being first three segments of equal breadth and a similar length, a little longer than broad, with a slight median carina; and then three others without a median carina and with continually decreasing length, the first of them (probably the eighth segment) half as long as the preceding, but of the same width; the next half as long as the one which precedes it, but narrower, and the last still narrower (but imperfect).

Length of the fragment 20^{mm}, of its third (seventh? abdominal) segment 4.5^{mm}; breadth of same 3.5.

(AGRIONINA.)

Dysagrion Fredericii Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. 4, 534–537.—This has already been sufficiently mentioned in the paper cited.

Podagrion abortivum.—A second species of *Agrionina*, at first sight very different from the preceding, proves to belong to the same legion (*Podagrion*); and, so far as its meagre representation by the specimen (No. 4169) goes, to the genus *Podagrion* proper, agreeing with it in the character of the pterostigma and the supplementary sectors. The specimen represents the apical part of a wing with fragments of the middle portion. The pterostigma is a little more than twice as long as broad, and although less oblique on the inner than on the outer side, yet lies at an angle of forty-five degrees with the costal edge, and is therefore more oblique than usual in *Podagrion*; its outer side is arcuate as well as very oblique, but in its entire extent the pterostigma scarcely surmounts two cellules; the outer side is much thicker than the inner, and thickens below as it passes gradually into the lower border, which, like the costal, is much thickened, and appears the more so from being independent of, although in conjunction with, the median nervure. Beyond the pterostigma, the ultranodal approaches the principal nervure very closely, so that they are only half as far apart at the margin as below the pterostigma; there are two supplementary sectors, one between the ultranodal and the nodal, arising below the outer half of the pterostigma, the other between the nodal and subnodal, arising slightly further back; both of these supplementary sectors are straight, but the nodal is slightly undulated after the origin of the supplementary sectors; all the other veins, excepting the extreme tip of the principal, are straight, and the reticulation tetragonal. The wing appears to be hyaline throughout, the pterostigma very slightly infumated, the nervures fusco-castaneous, those about the pterostigma deepening nearly to black. Apically the wing is well rounded, its apex falling in the middle and not at all produced. A species is indicated of about the size of *P. macropus* Sel.

Length of pterostigma along costal edge 1.5^{mm}, of same from inner lower angle to outer upper angle 2.1^{mm}; breadth of pterostigma 0.65^{mm}, of wing in middle of apical half 5.5^{mm}.

ARACHNIDA.

Nos. 3, 4^{a}, 4199, 4200, represent legs of the same or allied species of spider of about the size of *Epeira riparia* Hentz; femora and tibiæ and the sides of the tarsi are abundantly supplied with longitudinal rows of fine, long, black spines, the claw double. No. 36 preserves the spines alone of the same sort of leg.

Length of femora 7^{mm}, of tibiæ 7.75^{mm}, of tarsi 3.25, of claw 0.3^{mm}, of spines 0.75^{mm}.

No. 63 shows the hairy, subfusiform, ovate body of a spider apparently a little smaller than the above.

Length of abdomen 4.5^{mm}; breadth of same 1.8^{mm}.

No. 4201 is the egg-cocoon of a spider, and is of exactly the same size, shape, and general appearance as those from British Columbia, which I have described under the name of *Aranea columbiæ*, excepting that, from a break in the stone, there is no trace of a pedicel.

Length of egg-cocoon 5^{mm}; breadth 4^{mm}.

MYRIAPODA.

Iulus telluster.—A single Myriapod (No. 154^{a}) found by Mr. Richardson in the Green River bed is so fragmentary that it can only be referred to *Iulus* in a broad generic sense. The piece is composed of ten or twelve segments, probably from near the middle of the body, lying in a straight line and crushed, with no trace of any appendages. The segments appear to be composed of a short anterior and a larger posterior division, each independently and very slighly arched; the posterior division is about twice as long as the anterior, and each is transversely regularly and very finely striate parallel to the anterior and posterior margins of the segments. The foramina can be detected on some of the segments, and by their aid the width of the body can be more accurately determined. As crushed, the body is 2.3^{mm} broad, but its probable true width is 1.5^{mm}, while the segments are each about 0.8^{mm} long; the fragment preserved measures 8.5^{mm} long.

ART. XXXIII.—REPORT ON THE COLLECTION OF FISHES MADE BY DR. ELLIOTT COUES U. S. A. IN DAKOTA AND MONTANA DURING THE SEASONS OF 1873 AND 1874.

BY DAVID S. JORDAN, M. D.

[The fishes worked up by Professor Jordan in the present communication represent probably about two-thirds of the collection made during my connection with the United States Northern Boundary Commission, the remainder of the specimens having been lost or mislaid. I am informed, however, that the series submitted to Professor Jordan contains some novelties, rarities, and other specimens of sufficient interest to render publication desirable. I have incorporated a few collector's field-notes with the author's manuscript. The fishes taken in 1873 were secured in the waters of the Red and Mouse Rivers and some of their affluents; those secured in 1874 are from watersheds entirely different both from the last named and from each other, being partly taken from the Milk River and its northern tributaries, and partly from the Saint Mary's River, Chief Mountain Lake, and other headwaters of the Saskatchewan.

For articles on other portions of my collections see this Bulletin, this Vol., No. 1, pp. 259–292; No. 2, pp. 481–518; No. 3, pp. 545–661; No. 4, pp. 801–830.—ED.]

By some accident, the exact record of the localities of some of the smaller fishes has been lost or confused, and some of the specimens collected by Dr. Coues have failed to reach the writer, having probably been distributed through the general collection of the National Museum. I therefore add the field record of Dr. Coues, from which the general field of collection can be ascertained.

Collector's Memorandum.

1000. Catfish. Red River, near Pembina, Dakota. May 30, 1873.
1076. Pike [*Esox lucius*]. Near Turtle Mountain, Dakota. Aug. 10, 1873.
1084. Lot of small fish. Mouse River, Dakota. Aug. 17, 1873.
1100. Shovel-nosed Sturgeon [*Scaphirhynchops platyrhynchus*]. Fort Buford, Dakota. June 12, 1874.
1103–4–5. Catfish [*Ichthælurus punctatus*]. Big Muddy River. June 20, 1874.
1109–10. Lot of small fish [*Hyodon chrysopsis*]. Quaking Ash River. June 26, 1874.
1139. Sucker [*Catostomus teres*]. Two Forks Milk River. July 15, 1874.
1140. Cyprinoid. Two Forks Milk River. July 15, 1874.
1143. Sucker [*Catostomus teres*]. Two Forks Milk River. July 17, 1874.
1144. Cyprinoid. Two Forks Milk River. July 17, 1874.
1155–6. Lot of fish [*Pantosteus virescens*]. Sweetgrass Hills. July 29, 1874.
1162. Sucker [*Catostomus teres*]. Headwaters Milk River. Aug. 9, 1874.
1163–4–5. Lot of fish, three kinds. Headwaters Milk River. Aug. 9, 1874.
1168. Large fish. Headwaters Milk River. Aug. 14, 1874.
1169–70–1–2–3. Lots of fish. Headwaters Milk River. Aug. 14, 1874.
1174. River Trout [*Salmo clarki*]. Saint Mary's River. Aug. 16, 1874.
1175. "Gristle-nosed Fish" [*Polyodon folium ?*]. Saint Mary's River. Aug. 16, 1874.

1176. Pike [*Esox lucius*]. Saint Mary's River. Aug. 16, 1874.
1178. Lake Trout [*Cristivomer namaycush*]. Chief Mountain Lake. Aug. 18, 1874.
1179. Whitefish [*Coregonus quadrilateralis*]. Chief Mountain Lake. Aug. 18, 1874.
1182. Whitefish [*Coregonus couesi*]. Chief Mountain Lake. Aug. 18, 1874.
1189. Head of 18-lb. Salmon [*Salmo stomias*]. Chief Mountain Lake. Aug. 24, 1874.
1192. Sucker [*Catostomus teres*]. Chief Mountain Lake. Aug. 28, 1874.

Family ACIPENSERIDÆ.

Genus SCAPHIRHYNCHOPS Gill.

(*Scaphirhynchus* Heckel preoccupied.)

1.—SCAPHIRHYNCHOPS PLATYRHYNCHUS (Raf.) Gill.

Shovel-nosed Sturgeon.

1820—*Acipenser platorhynchus* RAF., Ich. Oh. p. 80
Acipenser platorhynchus KIRTLAND, Rept. Zool. Ohio, 1838, 196.
Acipenser platorhynchus KIRTLAND, Bost. Journ. Nat. Hist. v, 25.
Acipenser platorhynchus STORER, Synopsis Fish N. A. (1846), 501.
Scaphirhynchus platyrhynchus BAIRD, Iconogr. Encycl. ii, 1850, 238.
Scaphirhynchus platyrhynchus GIRARD, U. S. Pac. R. R. Surv. x, 357.
Scaphirhynchus platyrhynchus JORDAN, Man. Vert. 1876, 312, and of American writers generally.
Scaphirhynchops platyrhynchus GILL, 1867? (in a catalogue of fishes of the Missouri region; the reference not at hand. (Name only.)
Scaphirhynchops platyrhynchus COPE & YARROW, Zool. Lieut. Wheeler's Expl. W. 100th Mer. v, 1876, 639.
Scaphirhynchops platyrhynchus JORDAN & COPELAND, Check List Fishes, 1876, 161.
Scaphirhynchops platyrhynchus NELSON, Bull. Ills. Mus. Nat. Hist. 51, 1876.
Scaphirhynchops platyrhynchus JORDAN, Man. Vert. ed. 2d, 346, 1878.
Scaphirhynchops platyrhynchus JORDAN, Cat. Fishes N. Am. 413, 1878.
1834—*Acipenser cataphractus* GRAY, Proc. Zool. Soc. London, 122.
Scaphirhynchus cataphractus GÜNTHER, Cat. Fishes Brit. Mus. viii, 345, 1870.
1835—*Scaphirhynchus rafinesquii* HECKEL, Ann. Wiener Mus. Naturg. i, 71.
Scaphirhynchus rafinesquii HECKEL, Ann. Wien. Mus. Naturg. i, 72, pl. viii.
Scaphirhynchus rafinesquii BRUTZER, Dissert. Dorpat. 1860.

Dr. Coues writes me that he obtained a fine specimen of this species at Fort Buford, Dakota. I have not seen it, however. This species seems to be abundant in all the large streams between the Alleghanies and the Rio Grande. West of the Rio Grande Basin, it has not yet been noted.

The "Gristle-nosed Fish" from Saint Mary's River, recorded by Dr. Coues, is perhaps *Polyodon folium* Lac. I have not seen the specimen referred to.

Family SILURIDÆ.

Genus ICHTHÆLURUS Rafinesque.

2.—ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

Channel Cat. White Cat. Lady Cat.

1818—*Silurus punctatus* RAF., Amer. Monthly Mag. and Critical Review, Sept. 359.
Ictalurus punctatus JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 95.

Ictalurus punctatus Jordan (1876), Manual of Vertebrates, 300.
Ictalurus punctatus Jordan & Copeland (1876), Check List in Bull. Buff. Soc. Nat. Hist. 159.
Ictalurus punctatus Jordan (1877), Annals Lyc. Nat. Hist. N. Y. 350.
Ictalurus punctatus Nelson (1876), Bull. Ills. Mus. Nat. Hist. 50.
Ichthælurus punctatus Jordan (1877), Bull. U. S. Nat. Mus. ix, 38.
Ichthælurus punctatus Jordan (1877), Bull. U. S. Nat. Mus. x, 76.
Ichthælurus punctatus Jordan (1878), Man. Vert. ed. 2d, 328.
Ichthælurus punctatus Jordan (1878), Bull. Hayden's Geog. Geol. Surv. Terr. 415.
1819—*Pimelodus caudafurcatus* Le Sueur, Mémoires du Muséum, v, 152.
Amiurus caudafurcatus Günther (1864), Catalogue of Fishes, v, 102.
1820—*Silurus maculatus* Raf., Quarterly Journal of Science, Literature, and Arts, London, 48 (et var. *erythroptera*, 49).
Pimelodus (*Ictalurus*) *maculatus* Raf. (1820), Ichthyologia Ohiensis, 62.
1820—*Silurus pallidus* Raf., Quart. Journ. Sci. Lit. Arts, London, 49 (et vars. *marginatus*, *lateralis*, *leucoptera*).
Pimelodus pallidus Raf. (1820), Ich. Oh. 63.
Pimelodus pallidus Kirtland (1838), Report Zool. Ohio, 169, 194.
1820—*Silurus cerulescens* Raf., Quart. Journ. Sci. Lit. Arts, London, 49 (et var. *melanurus*).
Pimelodus cerulescens Raf. (1820), Ich. Ohiensis, 63.
Pimelodus cerulescens Kirtland (1838), Rept. Zool. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 332.
Pimelodus cerulescens Storer (1846), Synopsis Fishes N. A. in Mem. Nat. Acad. Sci. 405.
Ictalurus cœrulescens Gill (1862), Proc. Bost. Soc. Nat. Hist. 43.
Ictalurus cœrulescens Cope (1865), Proc. Acad. Nat. Sci. Phila. 85; (1870), Proc. Am. Philos. Soc. 489.
Ictalurus cœrulescens Jordan (1874), Ind. Geol. Survey, 222.
Ictalurus cœrulescens Gill (1876), Ich. Capt. Simpson's Exped. 417.
Ichthælurus cœrulescens Cope (1869), Journ. Acad. Nat. Sci. 237.
1820—*Silurus argentinus* Raf., Quart. Journ. Sci. Lit. Arts, London, 50.
1820—*Pimelodus argyrus* Raf., Ichthyologia Ohiensis, 64.
1840—*Pimelodus furcifer* Cuv. & Val., Hist. Nat. des Poiss. xv, 139.
Pimelodus furcifer "Hyrtl (1859), Denkschr. Akad. Wiss. Wien, 16".
Pimelodus furcifer "Kner, Sitzgsber. Akad. Wiss. Wien, xxvi, 421".
Ictalurus furcifer Gill (1862), Proc. Bost. Soc. Nat. Hist. 43.
Ictalurus furcifer Jordan (1876), Manual Vert. 300.
1852—*Pimelodus gracilis* Hough, Fifth Ann. Rept. Reg. Univ. Condition State Cabinet Nat. Hist. Albany, 26.
Synechoglanis gracilis Gill (1859), Trans. Lyc. Nat. Hist. 3 (reprint).
Ictalurus gracilis Gill (1862), Proc. Bost. Soc. Nat. Hist. 43.
Ictalurus gracilis Cope (1865), Proc. Acad. Nat. Sci. Phila. 85.
Ictalurus gracilis Jordan (1876), Man. Vert. 300.
Ictalurus gracilis Jordan & Copeland (1876), Check List, 159.
1858—*Pimelodus vulpes* Girard, Proc. Acad. Nat. Sci. Phila. 170; (1859), U. S. and Mex. Bound. Surv. 33.
Ictalurus vulpes Gill (1862), Proc. Bost. Soc. Nat. Hist. 43.
Ictalurus vulpes Jordan & Copeland (1876), Check List, 159.
1858—*Pimelodus olivaceus* Girard, Pac. R. R. Survey, x, 211.
Ictalurus olivaceus Gill (1862), l. c. 43; (1876), Rept. Ichthy. Capt. Simpson's Exp. 417.
Ictalurus olivaceus Jordan (1876), Man. Vert. 300.
Ictalurus olivaceus Jordan & Copeland (1876), Check List, 159.
1859—*Synechoglanis beadlei* Gill (1859), Trans. Lyc. Nat. Hist. N. Y. 2 (reprint).

Ictalurus beadlei Gill (1862), Proc. Bost. Soc. Nat. Hist. 43.
Ictalurus beadlei Jordan & Copeland (1876), Check List, 159.
1859—*Pimelodus houghii* Girard, Proc. Acad. Nat. Sci. Phila. 159.
1859—*Pimelodus megalops* Girard, Proc. Acad. Nat. Sci. Phila. 161.
Ictalurus megalops Jordan & Copeland (1876), Bull. Buff. Soc. Nat. Hist. 159.
1859—*Pimelodus graciosus* Girard, Proc. Acad. Nat. Sci. Phila. 161.
1860—*Pimelodus hammondii* Abbott, Proc. Acad. Nat. Sci. Phila. 568.
1860—*Pimelodus notatus* Abbott, Proc. Acad. Nat. Sci. Phila. 569.
1862—*Ictalurus simpsoni* Gill, Proc. Bost. Soc. Nat. Hist. 43; (1876), Ich. Capt. Simpson's Exp. 417.

Heads of three specimens, not obviously different from Eastern specimens of this widely diffused species. The specific names *olivaceus*, *simpsoni*, *hammondi*, and *notatus* have been given to Channel Cats from the Missouri region, chiefly on account of their "remote habitat"; but the examination of specimens does not show a shade of difference.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21203	1103	Big Muddy River, Dak	Dr. Elliott Coues	June 20, 1874
21204	1104	......do	......do	.....do.
21205	1105	......do	......do	.....do.

Family CATOSTOMIDÆ.

Genus PANTOSTEUS Cope.

3.—Pantosteus virescens Cope.

1876—*Pantosteus virescens* Cope, Lieutenant Wheeler's Expl. W. 100 Mer. v, Zool. 675.
Pantosteus virescens Jordan & Copeland, Check List Fishes N. A. 156, 1876.
Pantosteus virescens, Jordan, Bull. U. S. Geol. Surv. Terr. iv, 416, 1878.

Numerous small specimens, from two to seven inches in length, agreeing very well with Professor Cope's description. They all have the peculiar form of mouth, and the semi-cartilaginous maxillary sheath, which the other members of this genus and some of the species of *Catostomus* possess. The head is very short, forming barely one-fifth the length without caudal. The scales are very small, there being from 95 to 100 in the lateral line. All of these specimens have, however, a small fontanelle, which probably becomes closed with age; otherwise the species is to be referred to *Catostomus*. Its relations to *Catostomus discobolus* Cope are very close.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21191	1155	Sweet Grass Hills	Dr. Elliott Coues..........	July 29, 18[illegible]
21191	1156	......do	......do	.... do.

Genus CATOSTOMUS Le Sueur.

4.—CATOSTOMUS RETROPINNIS Jordan, sp. nov.

This species belongs to the subgenus of typical *Catostomus*. It is therefore related to *C. latipinnis*, *C. longirostris*, and *C. tahoensis*, and may be briefly characterized as having the body, scales, dorsal and ventral fins of *longirostris*, with the mouth and lips of *latipinnis*. Its nearest relations are, I think, with *latipinnis*, with which species it is compared below.

Body long and slender, subterete, compressed behind, the form therefore essentially that of *C. longirostris*, the depth contained 5½ times in the length. Head large, long, its length contained about four times in the total length without the caudal fin (4½ in *latipinnis*); interorbital space broad and flat, about 2½ times in length of head; eye small, high up, and posterior, entirely behind the middle of the head (near the middle in *latipinnis*); preorbital bone very long, its length about three times its depth (scarcely twice in *latipinnis*); the snout correspondingly prolonged; fontanelle quite small; mouth very large, formed as in *latipinnis*, but rather broader and not so long; upper lip pendent, very large, with a broad, free border, with 5 to 8 series of low tubercles, almost obliterated in the type-specimen, on account of the softening of the skin; lower lip very full, its posterior margin reaching to the nostrils (rather farther in *latipinnis*).

Dorsal fin not large, its rays I, 11 (I, 13, in *latipinnis*); its base about three-fifths the length of the head (five-sixths in *latipinnis*); its insertion unusually backward, much nearer base of caudal than the tip of the snout (much nearer the snout in *latipinnis*); caudal fin large, well forked, its rudimentary basal rays not greatly developed; anal fin long and high, reaching base of caudal; ventrals not reaching to vent (to vent in *latipinnis*); pectoral fins long.

Caudal peduncle rather stout and deep, its least depth more than one-third head (less than one-third in *latipinnis*); its length about two-thirds that of head (seven-eighths in *latipinnis*). In *latipinnis*, the caudal peduncle is notably long and slender.

Scales quite small, about as in *longirostris*, larger behind, the exposed portion not notably lengthened as in *latipinnis;* chest with well-developed scales (these rudimentary and imbedded in *latipinnis*).

The type is a large specimen, 16¾ inches long; a male, as is shown by the presence of tubercles on the anal and caudal fins, a fact confirmed by dissection. In coloration, it is rather dark, with traces of a dusky lateral band, which passes around the snout. This specimen is numbered 21197 on the Register of the National Museum.

Another specimen of this species is in the National Museum, from Platte River. It was identified by me as the female of *C. latipinnis*, the numerous differences in form being supposed to be sexual. As the types both of *latipinnis* and *retropinnis* are adult males, that supposition is not tenable.

So far as is known to me, but one genuine specimen of *C. latipinnis* is now known. It is the original type of Baird and Girard's description, from the Gila Basin, the one figured in the Ichthyology of the United States and Mexican Boundary Survey. It is in fine condition, and is well represented in the figure referred to. This specimen now lies before me, and the comparisons above made were taken from it.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21197	....	...... (?)	Dr. Elliott Coues..........	.....(?).

5.—CATOSTOMUS TERES (Mitchill) Le Sueur.

Common Sucker.

1803—"*Le Cyprin Commersonien*" Lacépède, Hist. Nat. des Poiss. v, 502, 508.
Catostomus commersonii Jordan (1878), Man. Vert. ed. 2d, 320.
Catostomus commersoni Jordan, Cat. Fishes N. Am. (1878), 416.
18——*Cyprinus catostomus* Peck, Mem. Am. Acad. ii, 55, pl. 2. (Not of Forster.)
1814—*Cyprinus teres* Mitchill, Lit. and Phil. Trans. N. Y. i, 458.
Catostomus teres Le Sueur (1817), Journ. Acad. Nat. Sci. Phila. 108.
Catostomus teres Thompson (1842), Hist. Vt. 134.
Catostomus teres Cuv. & Val. (1844), Hist. Nat. des Poissons, xvii, 468.
Catostomus teres Storer (1846), Synopsis Fish N. A. 423.
Catostomus teres Agassiz (1855), Am. Journ. Sci. Arts, 2d series, xix, 208.
Catostomus teres Günther (1868), Cat. Fishes Brit. Mus. vii, 15.
Catostomus teres Cope (1870), Proc. Am. Philos. Soc. Phila. 468.
Catostomus teres Jordan (1875), Fishes of Ind. 221.
Catostomus teres Jordan (1876), Man. Vert. 293.
Catostomus teres Nelson (1876), Bull. No. 1 Ills. Mus. Nat. Hist. 48.
Catostomus teres Jordan & Copeland (1876), Check List, 156.
Catostomus teres Jordan & Gilbert (1877), in Klippart's First Rep. Ohio Fish Com. 84, pl. xii, figs. 18, 19.
Catostomus teres Jordan (1877), Bull. U. S. Nat. Mus. ix, 37.
1817—*Catostomus communis* Le Sueur, Journ. Ac. Nat. Sci. Phila. i, 95.
Catostomus communis DeKay (1842), N. Y. Fauna, part iv, Fishes, 196.
Catostomus communis Cuv. & Val. (1844), Nat. Hist. des Poissons, xvii, 426.
Catostomus communis Kirtland (1845), Bost. Journ. Nat. Hist. v, 265.
Catostomus communis Storer (1846), Synopsis, 421.
Catostomus communis Cope (1868), Journ. Acad. Nat. Sci. Phila. 236.
Catostomus communis Uhler & Lugger (1876), Fishes of Maryland, 138.
1817—*Catostomus bostoniensis* Le Sueur, Journ. Acad. Nat. Sci. Phila. 106.
Catostomus bostoniensis Storer (1838), Rept. Ich. Mass. 84.
Catostomus bostoniensis Cuv. & Val. (1844), Hist. Nat. des Poiss. xvi, 432.
Catostomus bostoniensis Storer (1846), Synopsis, 423.
Catostomus bostoniensis Putnam (1863), Bull. Mus. Comp. Zool. 10.
Catostomus bostoniensis Gill (1865), Canadian Nat. 19, Aug.
Catostomus bostoniensis Storer (1867), Hist. Fishes Mass. 290, pl. xxii, f. 3.
Catostomus bostoniensis Thoreau (1868), Week on Concord and Merrimack, 36.
1820—*Catostomus flexuosus* Raf., Ich. Ohio, 59.

1823—*Catostomus hudsonius* RICH., Franklin's Journ. 717. (Not of Le Sueur.)
Cyprinus (*Catostomus*) *hudsonius* RICH. (1836), Fauna Bor.-Amer. Fishes, 112.
1836—*Cyprinus* (*Catostomus*) *reticulatus* RICHARDSON, Fauna Bor.-Amer. Fishes, 303.
1838—*Catostomus gracilis* KIRTLAND, Rept. Zool. Ohio, 168.
1838—*Catostomus nigricans* STORER, Rept. Ich. Mass. 86. (Not of Le Sueur.)
Catostomus nigricans THOMPSON (1842), Hist. Vt. 135.
1842—*Catostomus pallidus* DEKAY, N. Y. Fauna, part iv, Fishes, 200.
Catostomus pallidus STORER (1846), Synopsis, 426.
1844—*Catostomus aureolus* CUV. & VAL., Hist. Nat. des Poiss. xvii, 439. (Not of Le Sueur.)
Catostomus aureolus GÜNTHER (1868), Cat. Fishes Brit. Mus. vii, 16.
1850—*Catostomus forsterianus* AGASSIZ, Lake Superior, 358. (Not of Rich.)
Catostomus forsterianus AGASSIZ (1855), Am. Journ. Sci. Arts, 2d series, xix, 208.
Acomus forsterianus GIRARD (1856), Proc. Acad. Nat. Sci. Phila. 173.
1856—*Catostomus sucklii* GIRARD, Proc. Acad. Nat. Sci. Phila. 175.
Catostomus sucklii GIRARD (1858), U. S. Pac. R. R. Exp. x, pl. li, 226.
Catostomus sucklii COPE (1872), Hayden Geol. Surv. Wyoming, 434.
Catostomus sucklii JORDAN & COPELAND (1876), Check List, 156.
1860—*Catostomus texanus* ABBOTT, Proc. Acad. Nat. Sci. Phila. 473.
Catostomus texanus JORDAN & COPELAND (1876), Check List, 156.
1860—*Catostomus chloropteron* ABBOTT, Proc. Acad. Nat. Sci. Phila. 473.
Catostomus chloropteron COPE (1865), Proc. Acad. Nat. Sci. Phila. 85.
1876—*Catostomus chloropterus* JORDAN & COPELAND (1876), Check List, 156.

Numerous specimens, not differing in any noticeable respect from Eastern specimens of this universally distributed species. One or two of them have only ten dorsal rays.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
20191	....	....	Dr. Elliott Coues.....	
20194	....	....	.......do	

Family CYPRINIDÆ.

Genus PIMEPHALES Rafinesque.

6.—PIMEPHALES PROMELAS Rafinesque.

1820—*Pimephales promelas* RAF., Ich. Oh. 94.
Pimephales promelas KIRTLAND (1838), Rep. Zool. Oh. 194.
Pimephales promelas KIRTLAND (1838), Bost. Journ. Nat. Hist. iii, 475.
Pimephales promelas STORER (1846), Syn. 418.
Pimephales promelas AGASSIZ (1855), Am. Journ. Sci. Arts, 220.
Pimephales promelas PUTNAM (1863), Bull. M. C. Z. 8.
Pimephales promelas GÜNTHER (1868), Cat. Fishes, vii, 181.
Pimephales promelas JORDAN (1874), Ind. Geol. Surv. 224.
Pimephales promelas JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 94.
Pimephales promelas JORDAN (1876), Man. Vert. 275.
Pimephales promelas JORDAN & COPELAND (1876), Check List, 146.
Pimephales promelas NELSON (1876), Bull. Ills. Soc. Nat. Hist. 45.
Pimephales promelas JORDAN (1877), Bull. U. S. Nat. Mus. ix, 32.
Pimephales promelas JORDAN (1878), Man. Vert. ed. 2d, 288.

Pimephales promelas JORDAN, Cat. Fishes N. A. 419.
1856—*Pimephales fasciatus* GIRARD, Proc. Acad. Nat. Sci. Phila. 180.
Pimephales fasciatus GIRARD (1858), Pac. R. R. Surv. x, 234.
1860—*Plargyrus melanocephalus* ABBOTT, Proc. Acad. Nat. Sci. Phila. 325.
Pimephales melanocephalus JORDAN & COPELAND (1876), Check List, 146.
1864—*Pimephales milesii* COPE, Proc. Acad. Nat. Sci. Phila. 282.
Pimephales milesii GÜNTHER (1868), Cat. Fishes, vii, 181.
Pimephales milesii JORDAN (1876), Man. Vert. 276.
1866—*Pimephales agassizii* COPE, Cyp. Penn. 391.
Pimephales agassizii JORDAN (1874), Ind. Geol. Surv. 224.

Numerous specimens, to all appearance precisely like others from the Ohio River; the lateral line is imperfect and extends to a little past the beginning of the dorsal.

Genus COUESIUS Jordan, gen. nov.

7.—COUESIUS DISSIMILIS (Grd.) Jordan.

1856—*Leucosomus dissimilis* GRD., Proc. Acad. Nat. Sci. Phila. 189.
Leucosomus dissimilis GIRARD (1858), U. S. Pac. R. R. Exp. x, 250.
Semotilus dissimilis JORDAN, Bull. U. S. Geol. Surv. Terr. 1878, iv, 427.
1877—*Nocomis milneri* JORDAN, Bull. Nat. Mus. x, 64.
Ceratichthys milneri JORDAN (1878), Bull. U. S. Geol. Surv. Terr. iv, 427.
Ceratichthys milneri JORDAN (1878), Man. Vert. 2d ed. 307.

This species was first described by Girard from specimens from the Upper Missouri region, and referred by him to the genus *Leucosomus* (=*Semotilus*). As he did not describe especially its dentition, it has been presumed by myself and others that the species really was a *Semotilus*, and, if so, probably related to the Eastern *Semotilus bullaris* (*rhotheus* Cope), a species without the usual black dorsal spot.

Specimens collected in Lake Superior by Mr. J. W. Milner were lately described by me as *Nocomis* (=*Ceratichthys*) *milneri*, without a thought as to the necessity of comparing them with one of Girard's *Leucosomi*.

Comparison of the numerous specimens collected by Dr. Coues with Girard's description and my own leaves no doubt whatever in my mind as to their identity both with *Leucosomus dissimilis* and *Ceratichthys milneri*. The specific name *dissimilis*, however, cannot be used for this species, if referred to *Ceratichthys*, as there is already a "*dissimilis*" (*Leuciscus dissimilis* Kirtland) in the genus *Ceratichthys*. The reprehensible custom, so often practised by Girard, of giving, as specific names to new species, names already borne by species of allied genera, always leads to confusion as the boundaries of genera are changed. If referred to *Ceratichthys*, then the species should stand as *Ceratichthys milneri* Jordan.

Since the above was written, the author has reviewed some of the characters on which our current genera of *Cyprinidæ* rest. I am disposed to agree with Professor Cope that the presence or absence of the single tooth forming a second row is not, in most cases at least, a good generic character, as it is subject to many variations. I find, however, that in those species which have *two* teeth in the smaller row, that character is very constant. I find also that in those genera (*Luxilus*, *Alburnops*, *Ceratichthys*, *Cliola*, etc.) in which some of the species possess *two* teeth in the outer row, while others have no teeth or but one, those species with two teeth are strikingly different in general external characters and appearance from the others, and have in each of the above cases been already distinguished as subgenera (*Photogenis*, *Hydrophlox*, *Episema*), and in all but one have received distinctive names. The *Cyprinidæ* are small fishes, of low organization, and the very numerous species are very closely related. It seems advisable to divide the various forms related to *Leuciscus* into groups with distinctive names, which we may call "genera", although they may not be exactly co-ordinate with the genera of some family less rich in species. To combine them all into one genus, as has been attempted by Günther and Valenciennes, has led only to confusion and the almost utter loss of all knowledge of the species. Our tests of a "generic character" in such a group must be, Does it hold? Is it capable of exact definition and determination? Does it set off species really related, from others of more remote affinities? At present, the character of the two inner teeth seems to fill these requirements, and it is therefore held provisionally as a true generic character. It may be premised that this character requires verification in several species now referred to *Notropis*, *Luxilus*, *Cliola*, *Rhinichthys*, etc.

COUESIUS, gen. nov.

TYPE.—*Leucosomus dissimilis* Grd. = *Nocomis milneri* Jordan.

CHARACTERS.—*Leuciscinæ*, with the fins normal, the dorsal over or slightly posterior to ventrals, the basis of the anal short; mouth normal; end of the maxillary bone with a small but conspicuous barbel; scales rather small; lateral line present; intestinal canal short; teeth 2, 4–4, 2, those of the longer row hooked, sharp-edged, without grinding surface; upper jaw protractile.

This genus is dedicated to Elliott Coues, one of the very foremost of American students of vertebrates, to whose activity as a collector we owe the interesting collection which is the subject of the present paper.

The following analysis of the genera of American *Cyprinidæ* which now seem to me worthy of recognition will show the relations of the genus *Couesius* to its affines.

*. Dorsal fin without a strong, developed spine; ventral fins not decurrent on the abdomen.

†. Pharyngeal teeth developed.

‡. Dentary bones straight and flat, united throughout their length; mandible much incurved, tongue-like, a lobe on each side of it at base; air-bladder normal. (*Exoglossinæ.*)

a. Teeth hooked, 1, 4–4, 1, without grinding surface; dorsal fin nearly opposite ventrals; anal basis short; no barbel; premaxillaries not projectile; intestinal canal short. EXOGLOSSUM.

‡ Dentary bones arched, well separated except at their symphysis.

§. Air-bladder suspended in the abdominal cavity, surrounded by many convolutions of the long alimentary canal. (*Campostomatinæ.*)

b. Teeth 4-4 or 1, 4-4, 0, with oblique grinding surface, scarcely hooked; mouth small, inferior; upper jaw protractile; dorsal over, or slightly posterior to ventrals; base of anal short; alimentary canal 6 to 9 times the length of the body; no barbel..CAMPOSTOMA.

§§. Air-bladder contiguous to the roof of the abdominal cavity, and above the alimentary canal.

¶. Intestinal canal elongate, more than twice the length of the body; peritoneum usually more or less black; premaxillaries projectile. (*Chondrostomatinæ.*)

d. Each jaw provided with a firm, hard, straight, cartilaginous plate, that of the lower jaw hard and conspicuous; peritoneum black; intestinal canal elongate. (*Chondrostomatinæ.*)

c. Teeth 5-4, club-shaped, entire, hooked, with a broad, oblique grinding surface; dorsal fin slightly behind ventrals; anal base scarcely elongate (rays 9); caudal fin very long, with numerous accessory rays recurrent on the caudal peduncle; scales rather small, loosely imbricated; lateral line present; upper jaw protractile....................ACROCHILUS.

dd. Jaws without conspicuous horny plate.

e. Teeth 6-6, compressed, lanceolate, erect, very slightly bent inward; lower jaw sharp-edged, with a knob at the symphysis; dorsal over ventrals; basal caudal rays largely developed; scales small.....ORTHODON.

ee. Teeth 4-4.

f. Teeth cultriform, with oblique grinding surface and little or no hook; lips attenuate, without sheath; rudimentary dorsal ray firmly attached to the first developed ray.

g. Lateral line complete; dorsal over ventrals; mouth horizontal

—Scales very small..............................ZOPHENDUM.*

— — Scales large..............................HYBOGNATHUS.

gg. Lateral line incomplete; dorsal behind ventrals; mouth oblique.............................. COLISCUS.

ff. Teeth short, with grinding surface, and a small hook; rudimentary dorsal ray separated from the first developed ray by membrane; dorsal scales small.

h. Lateral line incomplete; no barbel..............PIMEPHALES.

hh. Lateral line complete; maxillary with a rudimentary or obsolete barbel....................HYBORHYNCHUS.

eee. Teeth 5-5 or 5-4, with grinding surface and hook; dorsal behind ventrals.

i. Lateral line incomplete; anal base short; scales very small. CHROSOMUS.

ii. Lateral line complete; anal base elongate; scales moderate; basal caudal rays largely developed....LAVINIA.

testinal canal short, little if any longer than the body; peritoneum mostly white. (*Leuciscinæ.*)

Teeth raptatorial, those of the main row more or less hooked.

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* *Zophendum*, gen. nov.; type "*Hyborhynchus*" *siderius* Cope.

k. Maxillary without barbel.
  l. Anal basis considerably elongate (of 12 to 25, rarely fewer, rays); belly behind ventrals compressed to an edge; lateral line decurved, complete.
    m. Teeth 5-5, sharp pointed, with grinding surface; anal rays 11 to 15 ....NOTEMIGONUS.
    mm. Teeth 2, 5-5, 2, entire, without grinding surface; anal rays 13 to 30 ....ALBURNUS.*
  ll. Anal basis shorter (of 7 to 11 rays); abdomen not compressed to an edge.
    n. Teeth 1, 3-3, 1, without grinding surface; dorsal behind ventrals; isthmus very wide ....TIAROGA.
    nn. Teeth in the main row 4-4.
      o. Opercular and mandibular bones, without externally visible cavernous chambers.
        p. Teeth with grinding surface developed.
          q. Jaws with a hard, bony sheath, resembling the teeth of *Tetrodon;* teeth 4-4; rudimentary dorsal ray connected by membrane...........COCHLOGNATHUS.
          qq. Jaws normal; rudimentary dorsal ray attached.
            r. Teeth 4-4 or 1, 4-4, 1; anal basis short (rays 7 to 9).
              s. Scales very small ....ALGANSEA.
              ss. Scales large.
                t. Lateral line complete ....HUDSONIUS.
                tt. Lateral line incomplete ....CHRIOPE.†
            rr. Teeth 2, 4-4, 2.
              u. Dorsal fin over or slightly behind ventrals; anal basis short (8 or 9 rays)................LUXILUS.
              uu. Dorsal fin much behind ventrals; anal basis elongate (10 to 12 rays)...... ......LYTHRURUS.
        pp. Teeth without masticatory surface, their edges serrate or entire.
          v. Lips thin, normal; lateral line complete.
            w. Teeth 2, 4-4, 2 ....NOTROPIS.
            ww. Teeth 4-4 or 1, 4-4, 1.....................CLIOLA.
          vv. Lips thin; lateral line incomplete; teeth 1, 4-4, 2. PROTOPORUS.
          vvv. Lips thick, fleshy, enlarged behind; mouth small, inferior; dorsal fin beginning in front of ventrals; teeth 4-4; lateral line complete ..PHENACOBIUS.
      oo. Opercular and mandibulary bones with externally visible cavernous chambers; teeth 1, 4-4, 0, without grinding surface; lips normal; dorsal over ventrals ....ERICYMBA.
    nnn. Teeth in the main row 5-5 or 5-4.
      A. Lateral line incomplete.
        B. Dorsal fin over ventrals; scales large; teeth 4-5, with grinding surface.................HEMITREMIA.
        BB. Dorsal fin behind ventrals; scales small; teeth 2, 5-5, 2 (or 2, 5-4, 2), without grinding surface.PHOXINUS.
      AA. Lateral line complete.
        C. Teeth raptatorial, entire, without grinding surface, 2, 5-4 or 5, 2 or 1.

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lburnus Heckel = *Richardsonius* Grd.
hriope, gen. nov.; type *Hybopsis bifrenatus* Cope.

D. Teeth subconic, little hooked, wide set. PTYCHOCHILUS.

DD. Teeth compressed, hooked, close set.

— Caudal peduncle very slender, the basal caudal rays much developed .... GILA.

— — Caudal peduncle stout, the basal caudal rays little developed .... TELESTES.[*]

CC. Teeth raptatorial, with developed grinding surface.

E. Teeth 2, 5–4 or 5, 2 or 1 .... SQUALIUS.[†]

EE. Teeth 4–5 or 5–5 .... LEUCOS.[‡]

kk. Maxillary with a small barbel; teeth hooked.

F. Premaxillaries projectile, a groove separating the upper lip from the forehead.

G. Teeth 2, 4–5–2, without grinding surface; barbel minute, not at the end of the maxillary; dorsal more or less posterior to ventrals .... SEMOTILUS.

GG. Teeth 2, 5–4, 2, or 2, 5–5, 2, with grinding surface; barbel terminal.

— Caudal fin symmetrical, the rudimental basal rays little developed .... SYMMETRURUS.[§]

— — Caudal fin unsymmetrical, the rudimental basal rays largely developed .... POGONICHTHYS.

GGG. Teeth in the principal row 4–4; barbel terminal.

I. Teeth without grinding surface.

J. Dorsal behind ventrals; scales small; teeth mostly 1, 4–4, 1 .... APOCOPE.

JJ. Dorsal over ventrals or slightly posterior; scales moderate or rather large.

K. Teeth 4–4, or 1, 4–4, 1 .... CERATICHTHYS.

KK. Teeth 2, 4–4, 2 .... COUESIUS.

II. Teeth with developed grinding surface.

L. Dorsal fin more or less directly above ventrals; scales large; teeth 2, 4–4, 2.

LL. Dorsal fin wholly behind ventrals; scales small; teeth 4–4 .... AGOSIA.

FF. Premaxillaries not projectile; teeth mostly 2, 4–4, 2, without grinding surface; scales small; dorsal behind ventrals; barbel terminal .... RHINICHTHYS.

jj. Teeth molar, of the grinding type, two or three of the main row blunt and much enlarged; teeth in three rows, the outer deciduous, 2 or 3, 2, 5–4, 2, 2 or 3.

M. Upper jaw not protractile; no barbel; dorsal fin beginning behind ventrals .... MYLOPHARODON.

MM. Upper jaw protractile; maxillary with a barbel; dorsal over ventrals .... MYLOCHILUS.

††. Pharyngeal teeth quite rudimental, replaced by a somewhat uneven ridge of the bone. (*Graodontinæ.*)

N. Dorsal fin short, without spinous ray, opposite ventrals; anal basis short; mouth small, without barbel, the upper jaw somewhat the larger; intestinal canal short; lateral line complete .... GRAODUS.

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[*] ***Telestes*** Bonaparte = ***Tigoma, Siboma,*** and ***Clinostomus*** Grd.

[†] *Squalius* Bonaparte = ***Cheonda*** Grd.

[‡] *Leucos* Heckel = ***Myloleucus*** Cope.

[§] ***Symmetrurus,*** gen. nov.; type ***Pogonichthys argyreiosus*** B. & G.

**. Dorsal fin with a strong spine, which is composed of two, the posterior received into a longitudinal groove of the anterior; inner border of the ventral fins adherent to the body dorsal behind ventrals; teeth hooked, without grinding surface. (*Plagopterinæ.*)

O. Body with small scales; teeth 2, 4–4, 2; no barbel................LEPIDOMEDA.
OO. Body naked.
P. Teeth 1, 4–4, 1; no barbel..MEDA.
PP. Teeth 2, 5–4, 2; a barbel at the end of the maxillary..........PLAGOPTERUS.

The relations of the European and American genera of *Cyprinidæ* may be approximately indicated by the following grouping. The clusters of genera here indicated as "groups" have about the value attached by the "ultra conservative" writers to their "genera". The subfamilies here recognized, of *Chondrostomatinæ*, *Leuciscinæ*, and *Abramidinæ*, are very closely connected by their American representatives, perhaps too closely for recognition. The group *Graodontinæ* is admitted provisionally, the singular character ascribed to the genus *Graodus* being possibly erroneous. I have not examined the intestines of *Rhodeus* and *Leucos*, and their positions in the series may require change. The type of the European genus *Squalius* has a narrow grinding surface on its teeth, and it is congeneric with the species referred by Girard to *Cheonda*. In like manner, our current genera *Richardsonius*, *Tigoma*, and *Myloleucus* are equivalent to *Alburnus*, *Telestes*, and *Leucos*.

European genera are designated by an asterisk (*); genera common to Europe and America by a dagger (†).

Subfamily CAMPOSTOMATINÆ.
  Campostoma Agassiz.
Subfamily CHONDROSTOMATINÆ.
  Group ACROCHILI.
    Acrochilus Agassiz.
  Group CHONDROSTOMATA.
    *Chondrorhynchus** Heckel.
    *Chondrostoma** Agassiz.
  Group ORTHODONTES.
    Orthodon Girard.
  Group LAVINIÆ.
    Lavinia Girard.
  Group RHODEI.
    *Rhodeus** Agassiz.
  Group CHROSOMI.
    Chrosomus Rafinesque.
  Group HYBOGNATHI.
    Zophendum Jordan.
    Hybognathus Agassiz.
    Coliscus Cope.
    Pimephales Rafinesque.
    Hyborhynchus Agassiz.
Subfamily EXOGLOSSINÆ.
  Exoglossum Rafinesque.
Subfamily GRAODONTINÆ.
  Graodus Günther.

Subfamily LEUCISCINÆ.
  Group TIAROGÆ.
    Tiaroga Girard.
  Group COCHLOGNATHI.
    Cochlognathus Baird & Girard.
  Group LUXILI.
    Algansea Girard.
    Hudsonius Girard.
    Chriope Jordan.
    Cliola Girard (*Codoma*, *Cyprinella*, etc.).
    Protoporus Cope.
    Notropis Rafinesque.
    Lythrurus Jordan.
    Luxilus Rafinesque.
  Group ERICYMBÆ.
    Ericymba Cope.
  Group PHENACOBII.
    Phenacobius Cope.
  Group RHINICHTHYES.
    Rhinichthyes Agassiz.
  Group CERATICHTHYES.
    Agosia Girard.
    Ceratichthys Baird.
    Apocope Cope.
    Couesius Jordan.
    Platygobio Gill.

- Subfamily LEUCISCINÆ.
  - Group GOBIONES.
    - *Gobio** Cuvier.
    - *Semotilus* Rafinesque.
    - *Symmetrurus* Jordan.
    - *Pogonichthys* Girard.
  - Group TINCÆ.
    - *Tinca** Cuvier.
  - Group MYLOCHILI.
    - *Mylochilus* Agassiz.
  - Group MYLOPHARODONTES.
    - *Mylopharodon* Ayres.
  - Group LEUCISCI.
    - *Scardinius** Bonaparte.
    - *Idus** Heckel.
    - *Ptychochilus* Agassiz.
    - *Gila* Baird & Girard.
    - *Telestes**† Bonaparte.
    - *Squalius**† Bonaparte.
    - *Phoxinus**† Agassiz.
    - *Phoxinellus* Heckel.
    - *Leucos**† Heckel.
    - *Leuciscus* Cuvier.
- Subfamily ABRAMIDINÆ.
  - Group ABRAMIDES.
    - *Leucaspius** Heckel.
    - *Notemigonus* Rafinesque.
    - *Abramis** Cuvier.
    - *Blicca** Heckel.
    - *Alburnus**† Heckel.
    - *Aspinus** Agassiz.
  - Group PELECI.
    - *Pelecus** Agassiz.
- Subfamily PLAGOPTERINÆ.
    - *Lepidomeda* Cope.
    - *Plagopterus* Cope.
    - *Meda* Girard.
- Subfamily AULOPYGINÆ.
    - *Aulopyge** Heckel.
- Subfamily BARBINÆ.
    - *Barbus** Cuvier.
- Subfamily CYPRININÆ.
  - Group CYPRINI.
    - *Cyprinus** Linnæus.
  - Group CARASSII.
    - *Carassius** Nilsson.

The following species are to be referred to the genus *Couesius*:—*Couesius dissimilis*, = *Leucosomus dissimilis* Girard; *Couesius prosthemius*, = *Ceratichthys prosthemius* Cope; *Couesius squamilentus*, = *Ceratichthys squamilentus* Cope; *Couesius physignathus*, = *Ceratichthys physignathus* Cope.

In *C. dissimilis*, the dorsal fin is almost directly over the ventrals; the mouth is large and quite oblique, the jaws being about equal; the maxillary barbel is very distinct; the scales are about 11–70–9. In the collection are 50 specimens of all sizes, from one inch in length to about five.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21206	....	...... (?)	Dr. Elliott Coues..........	.....(?).

Genus RHINICHTHYS Agassiz.

8.—RHINICHTHYS MAXILLOSUS Cope.

1864—*Rhinichthys maxillosus* COPE, Proc. Ac. Nat. Sci. Phila. 278.
Rhinichthys maxillosus GÜNTHER (1868), Cat. Fishes Brit. Mus. vii, 190.
Rhinichthys maxillosus JOR. (1873), Bull. U. S. Geol. Sur. Terr. iv, 426.

Forty-three specimens of this species were obtained, from one to four inches in length. The species is somewhat intermediate between the Eastern *R. cataractæ* (*R. nasutus* Ag.) and *R. atronasus*. The specimens agree well with Professor Cope's figure in the Report of the Ichthyology of Lieutenant Wheeler's Explorations, but they differ slightly in proportions from the original description. *Rhinichthys dulcis* Girard is apparently a different fish, similar to and probably identical with *Rhinichthys obtusus* Ag. (=*Rhinichthys lunatus* Cope).

Genus CLIOLA Girard.

9.—CLIOLA CHLORA Jordan, sp. nov.

A small pale species, resembling a *Notropis*. Body slender, compressed, resembling in form that of *Notropis rubrifrons* Cope, the greatest depth, at the beginning of the dorsal, contained about five times in the length. Head rather small, 4¼ in length, the eye rather large, longer than snout, forming about one-third the length of the head, about equal to the width of the interorbital space; mouth small, quite oblique, the lower jaw included when the mouth is closed, the maxillary scarcely reaching to the front of the eye.

Scales very large, 4-35-3, about 12 in front of the dorsal fin; body entirely scaly except the thoracic region; lateral line decurved in front, thence nearly straight.

Dorsal fin beginning about midway of the body, directly over the ventrals, rather high, its rays, I, 7; anal fin short and high, I, 7; pectorals not reaching nearly to ventrals, the latter almost to vent.

Teeth hooked, without masticatory surface, in one row, 4-4.

Coloration quite pale; back greenish; cheeks and sides with a silvery band, belly white. No spots on the fins except sometimes a dusky shade at base of caudal; no dusky or plumbeous shading on the body.

Length of types about 2½ inches each. There are twelve of these typical examples, numbered 20193 in the United States National Museum.

The affinities of this small species seem to be rather with the Texan species, *C. vivax* and *C. velox*, than with the other forms now referred to this genus.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
20193	....	...... (?)	Dr. Elliott Coues	... (?).

Genus PROTOPORUS Cope.

10.—PROTOPORUS, sp. nov.?

Mixed with the specimens of *Cliola chlora* were several individuals in poor condition, with the teeth 4-4, hooked, without grinding surface, and the lateral line incomplete. If this latter character is permanent, and a lateral line is not developed with age, the species is perhaps referable to the genus *Protoporus*. The only species of that genus, *P. domninus* Cope, has two rows of teeth (teeth 2, 4-4, 1), so that the present species, if a *Protoporus*, is at least specifically distinct. My specimens are, however, neither adult nor in good condition, and I prefer to leave the task of describing a new species to some later observer.

Family HYODONTIDÆ.

Genus HYODON Le Sueur.

11.—HYODON (ELATTONISTIUS) CHRYSOPSIS Rich.

Gold Eye. Northern Moon-eye. "Nacoaysh."

1823—*Hyodon clodalus* RICH., Franklin's Journal, 716. (Not of Le Sueur.)
1836—*Hyodon chrysopsis* RICH., Fauna Bor.-Am. iii, 532.
Hyodon chrysopsis DEKAY, New York Fauna, Fishes, 1842, 267.
Hyodon chrysopsis STORER, Synopsis Fishes N. A. 1846, 463.
Hyodon chrysopsis JORDAN, Bull. U. S. Nat. Mus. x, 67, 1878.
Hyodon chrysopsis JORDAN, Man. Vert. ed. 2d, 277, 1878.
Hyodon chrysopsis JORDAN, Bull. Hayden's Geol. Surv. Terr. iv, 429.

This beautiful species was first described by Richardson from specimens obtained in the Saskatchawan region. For a time after Richardson's day the species was kept alive by compilers, but for the last twenty-five years it has been generally ignored or considered a mere synonym of *Hyodon tergisus*. For its rediscovery science is indebted to the collection now under consideration. Its resemblance to *H. tergisus* is not very great; the body is very much more compressed than in the latter species, the abdomen being almost cultrate, while the dorsal fin is reduced in size, having only about nine developed rays. In view of these peculiarities, Dr. Gill and myself have proposed for it the subgeneric name of *Elattonistius*. At present, *Elattonistius* is considered as a subgenus of *Hyodon*, but if no intermediate forms occur it may require elevation to full generic rank. The following analysis of the species of *Hyodon* gives the principal distinctive characters of the three species now known: *Elattonistius chrysopsis*, *Hyodon tergisus* Le S., and *Hyodon selenops* Jordan & Bean.

*. Dorsal fin reduced, and with only about nine fully developed rays; abdomen sharply carinated (*Elattonistius*):

  †. Dorsal fin very small, of about nine *developed* rays (besides the two or three rudiments), the length of its longest rays half greater than the length of the base of the fin; body deep, closely compressed, the belly strongly carinated both before and behind ventrals; eye moderate (about 3¼ in head); scales rather closely imbricated, 5–58–8; pectoral fins falcate, nearly as long as the head, nearly or quite reaching ventrals; anal with 30 or 31 developed rays; head 4¼ in length; depth 3¼ .... CHRYSOPSIS.

**. Dorsal fin moderate and with eleven or twelve fully developed rays; abdomen more or less obtuse (*Hyodon*):

  †. Dorsal fin larger, of about 12 developed rays; its longest rays scarcely longer than the base of the fin; form of body intermediate; the belly in front of ventrals obtusely carinated; eye large, about 3 in head; scales medium, 5–58–8; pectoral fins decidedly shorter than head, not reaching nearly to ventrals; anal rays 28 or 29; head 4¼ in length, the depth about 3 .... TERGISUS.

††. Dorsal fin moderate, of 11 or 12 developed rays, nearly as long as high in front; body elongate, not greatly compressed; the belly in front of ventrals transversely rounded, not carinated; eye very large, about 2¼ in head; scales loosely imbricated, 4–50–7; pectoral fins considerably shorter than head, not reaching nearly to ventrals; anal rays 27; head 4½ in length; depth about 4 ....SELENOPS.

Numerous specimens are in the collection, obtained by Dr. Coues in Quaking Ash River, a tributary of the Upper Missouri, June 26, 1874.

Family SALMONIDÆ.

[I obtained no *Salmonidæ* from any of the Missouri or Milk River waters, but found this family abounding in the lake and river headwaters of the Saskatchewan. The St. Mary's, for instance, was full of the beautiful trout identified by Prof. Jordan as *S. clarki* var. *aurora*, and in Chief Mountain Lake, at an elevation of about 4,000 feet, the Great Mackinaw Trout, *Cristivomer namaycush*, was very plentiful. There being no tackle in the party stout enough to handle these fellows with, the men used to catch them with hooks made from the handles of camp-kettles, attached to a piece of tent-rope and baited with salt pork; usually pushing out on the lake on a raft, and hauling in the game just as a fisherman would take cod. I think there are in these same waters one or two other *Salmonidæ*, besides the two Whitefish.—C.]

Genus COREGONUS Linnæus.

12.—COREGONUS COUESI Milner.

Chief Mountain Whitefish.

1874—*Coregonus couesi* MILNER, Rept. Com. Fish and Fisheries for 1872–73, 88.
Coregonus couesi JORDAN & COPELAND, Check List Fishes N. A. 145, 1876.
Coregonus couesi JORDAN, Man. Vert. 2d ed. 276, 1878.
Prosopium couesi MILNER, MSS.—JORDAN, Man. Vert. 2d ed. 362, 1878.
Coregonus couesi JORDAN, Bull. U. S. Geol. Surv. iv, 429, 1878.

This interesting species was described by Mr. Milner from the specimen in the present collection. I have nothing new to add to his very complete account.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
14146	1182	Chief Mountain Lake..............	Dr. Elliott Coues......	Aug. 19, 1874.

13.—COREGONUS QUADRILATERALIS Richardson.

Menomonee Whitefish. Shad-waiter.

1823—*Coregonus quadrilateralis* RICHARDSON, Franklin's Journal, 714.
Coregonus quadrilateralis RICHARDSON, Fauna Bor.-Am. iii, 204, pl. 89, f. 1.
Coregonus quadrilateralis CUVIER & VALENCIENNES, Hist. Nat. des Poiss. xxi, 512.
Coregonus quadrilateralis DEKAY, New York Fauna, Fishes, 249, 1842.
Coregonus quadrilateralis STORER, Synopsis Fishes N. A. 453, 1846.
Coregonus quadrilateralis AGASSIZ, Lake Superior, 351, 1850.
Coregonus quadrilateralis GÜNTHER, Cat. Fishes Brit. Mus. vi, 1867, 176.

Coregonus quadrilateralis Milner, Rept. Comm. Fish and Fisheries for 1872–73, 49, 1874.
Coregonus quadrilateralis Jordan & Copeland, Check List Fishes N. A. 145, 1876.
Coregonus quadrilateralis Jordan, Man. Vert. ed. 2d, 276, 1878.
Prosopium quadrilaterale, Milner, MSS.—Jordan, Man. Vert. ed. 2d, 276, 1878.
Coregonus (*Prosopium*) *quadrilateralis* Jordan, Bull. U. S. Geol. Surv. iv, 429, 1878.
1851—*Coregonus novœ-angliœ* Prescott, Silliman's Am. Journ. Sc. Arts, xi, 342.
Coregonus novœ-angliœ Günther, Cat. Fishes Brit. Mus. vi, 186, 1867.

A single specimen, in poor condition, but probably referable to this species, is in the collection. The head is somewhat crushed, so that the form of the mouth is not shown. Both this species and the preceding belong to a well-marked subgenus, called by Mr. Milner *Prosopium*.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21202	1179	Chief Mountain Lake..............	Dr. Elliott Coues......	Aug. 18, 1874.

Genus CRISTIVOMER Gill & Jordan.

14.—CRISTIVOMER NAMAYCUSH (Walbaum) Gill & Jordan.

Mackinaw Trout. Great Lake Trout. Longe. Togue.

1792—*Namaycush salmon* (not "*Salmo namaycush*", as quoted by authors) Pennant, Arctic Zoology, Introduction, 141; vol. ii, 139. (British America.)
Salmo namaycush Walbaum, Artedi Pisc. p. —.
Salmo namaycush Bloch, Schneider, Syst. Ich. 1801.
Salmo namaycush Rich., Fauna Bor.-Amer. iii, 179, pl. 79, and pl. 85, f. 1, 1836.
Salmo manycash (*sic*) Kirtland, Rept. Zool. Ohio, 105, 1838.
Salmo namaycush Kirtland, Bost. Journ. Nat. Hist. iv, 25, pl. 3, f. 2, 1842.
Salar namaycush Cuv. & Val., Hist. Nat. des Poissons xxi, 348, 1848.
Salmo namaycush Agassiz, Lake Superior, 331, 1850.
Salmo namaycush Günther, Cat. Fishes Brit. Mus. vi, 123, 1867.
Salmo namaycush Milner, Rept. Comm. Fish and Fisheries for 1872–73, 38, 1874.
Salmo namaycush Suckley, Monograph Genus Salmo, 151, 1874.
Salmo namaycush Jordan, Man. Vert. 260, 1876.
Salmo namaycush Nelson, Bull. Ills. Mus. Nat. Hist. 44, 1876.
Salmo namaycush, Jordan, Man. Vert. ed. 2d, 272, 1878.
Cristivomer namaycush Gill & Jordan, MSS.—Jordan, Man. Vert. ed. 2d, 359, 1878.
Cristivomer namaycush Jordan, Bull. U. S. Geol. Surv. Terr. iv, 430, 1878.
1817—*Salmo pallidus* Rafinesque, Am. Month. Mag. and Critical Review, 120. (Lake Champlain.)
1818—*Salmo amethystus* Mitchill, Journ. Acad. Nat. Sci. Phila. v. 1, 410. (Great Lakes.)
Salmo amethystus DeKay, New York Fauna, Fishes, 240, pl. 76, 1842.
Salmo amethystus Storer, Synopsis Fishes N. A. 193, 1846.
1842—*Salmo confinis* DeKay, New York Fauna, Fishes, 236. (Louis Lake, N. Y.)
Salmo confinis Storer, Synopsis Fishes N. A. 193, 1866.
Salmo confinis Suckley, Monograph Genus Salmo, 153, 1874.

Salmo confinis Jordan, Man. Vert. 261, 1876.
Salmo confinis Jordan, Man. Vert. ed. 2d, 273, 1878.
1850—*Salmo symmetrica* Prescott, Silliman's Am. Journ. Sci. Arts, 2d series, xi, 340, 1850. (Lake Winnipiseogee.)
Salmo symmetrica Suckley, Monograph Genus Salmo, 157, 1874.
Salmo symmetrica Jordan, Man. Vert. 261, 1876.
Salmo symmetrica Jordan, Man. Vert. ed. 2d, 273, 1878.
1863—*Salmo toma* Hamlin, Second Annual Rept. Nat. Hist. and Geol. Maine for 1862, p.—. (Lakes of Maine.)
Salmo toma Hamlin, Rept. Comm. Fish and Fisheries for 1872–73, 354, 1874.
1864—*Salmo adarondacus* Norris, Angler's Guide, p. —. (Adirondack Region.)

The head and caudal fin of a large specimen from Chief Mountain Lake. It does not differ in any obvious respect from Lake Michigan specimens. On examination of specimens supposed to be typical of each of the various nominal species included above, I am unable to see that they differ in any respect likely to prove constant.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21200	1178	Chief Mountain Lake	Dr. Elliott Coues	Aug. 18, 1874.

Genus SALMO Linnæus.

Subgenus SALAR Valenciennes.

15.—Salmo stomias Cope.

Big-mouthed Trout.

1872—*Salmo* (*Salar*) *stomias* Cope, Hayden's Geol. Surv. Wyoming for 1870, 433.
Salmo stomias Cope, Hayden's Geol. Surv. Montana for 1871, 470, 1872.
Salmo stomias Cope & Yarrow, Wheeler's Expl. W. 100th Mer. v, 684, 1876.
Salmo stomias Hallock, Sportsman's Gazetteer, 346, 1877.
Salmo stomias var. *stomias* Jordan, Man. Vert. ed. 2d, 358, 1878.
Salar stomias Jordan, Catalogue of Fishes N. A. 431, 1878.

This species is represented in the collection by a single head, 5½ inches in length, accompanied by the caudal fin. Before seeing specimens of this species, I had presumed that it might have been based on some one of the numerous varieties of *Salmo pleuriticus* Cope. There can be, however, no doubt of its specific distinctness. The following description is taken from this head, No. 21199, from Chief Mountain Lake:—

Head very long, rather pointed, broad and flat above, not carinated: the snout not at all gibbous or convex from the eyes forward, the head thus having a depressed and pike-like appearance.

Mouth very wide, the broad curved maxillary reaching much beyond the eye: eye moderate; snout in this specimen prolonged, emarginate at the end, receiving the swollen tip of the lower jaw; caudal fin scarcely emarginate and unspotted, as is the head.

Hyoid bone with a band of rather strong teeth. This character will at once separate it from *S. pleuriticus*, which has similarly small scales, as that species never has hyoid teeth; the relations of this fish are therefore as much with *S. clarki* and *S. henshawi*, as with *spilurus* and *pleuriticus*. From both *S. henshawi* and *S. clarki* it differs in the form of the head and small size of the scales; from *S. henshawi* notably in the form of the caudal fin. The following are the measurements of the head:—

Snout in head 3½; eye in head 6⅘; interorbital space in head 3⅔; maxillary in head 2¼; mandible in head 1⅓; length of head in inches 5½. The snout and bones of jaws are doubtlessly shorter in the female.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21199	1189	Chief Mountain Lake...............	Dr. Elliott Coues......	Aug. 24, 1874.

16.—SALMO CLARKI Rich.

Var. *aurora* (Grd.) Gill & Jordan.

Missouri River Trout. Utah Trout.

Var. *clarki*.

1836—*Salmo clarkii* RICHARDSON, Fauna Bor.-Amer. iii, 225.
Salmo clarkii STORER, Synopsis Fishes N. Am. 197, 1846.
Salmo clarkii HERBERT, Frank Forrester's Fish and Fishing, Suppl. 40, 1850.
Salmo clarkii SUCKLEY, Nat. Hist. Wash. Terr. 344, 1860.
Salmo clarkii SUCKLEY, Monograph Genus Salmo, 112, 1874.
Salmo clarkii JORDAN, Man. Vert. ed. 2d, 359, 1878.
Salar clarkii JORDAN, Bull. U. S Geol. Surv. Terr. 430, 1878.
1856—*Fario stellatus* GRD., Proc. Ac. Nat. Sc. Phila. 219.
Fario stellatus GIRARD, U. S. Pac. R. R. Exp. Fish, 316, pl. 69, f. 5–8.
Fario stellatus SUCKLEY, Nat. Hist. Wash. Terr. 346, 1860.
1861—*Salmo brevicauda* SUCKLEY, Ann. N. Y. Lyc. Nat. Hist. vii, 308.
Salmo brevicauda GÜNTHER, Cat. Fishes Brit. Mus. vi, 120, 1867.
Salmo brevicauda SUCKLEY, Monograph Gen. Salmo, 140, 1874.

Var. *aurora*.

1856—*Fario aurora* GRD., Proc. Ac. Nat. Sc. Phila. 218. (Based on two young specimens.)
Fario aurora GRD., Pac. R. R. Rep. x, 308, 1858.
Salmo aurora SUCKLEY, Nat. Hist. Wash. Terr. 343, pl. 68, 1860.
Salmo aurora GÜNTHER, Cat. Fishes Brit. Mus. vi, 119, 1867.
Salmo clarkii var. *aurora* JORDAN, Man. Vert. ed. 2d, 359, 1878.
Salar clarkii var. *aurora* JORDAN, Bull. U. S. Geol. Surv. Terr. iv, 430, 1878.
1856—*Salar lewisi* GIRARD, Proc. Ac. Nat. Sc. Phila. 219.
Salar lewisi GIRARD, U. S. Pac. R. R. Expl. Fish, 318, pl. 72, 1858.
Salmo lewisi SUCKLEY, Nat. Hist. Wash. Terr. 348, 1860.
Salmo lewisi GÜNTHER, Cat. Fishes Brit. Mus. vi, 122, 1867.
Salmo lewisi SUCKLEY, Monograph Genus Salmo, 139, 1874.
1856—*Salar virginalis* GIRARD, Proc. Ac. Nat. Sc. Phila. 220.
Salar virginalis GIRARD, Pac. R. R. Expl. Fish, 320, pl. 73, f. 1–4, 1858.
Salmo virginalis SUCKLEY, Nat. Hist. Wash. Terr. p. —, 1860.
Salmo virginalis GÜNTHER, Cat. Fishes Brit. Mus. vi, 123, 1867.
Salmo virginalis SUCKLEY, Monograph Gen. Salmo, 135, 1874.

Salmo virginalis Cope & Yarrow, Wheeler's Expl. W. 100th Mer. 685, 1876.
1872—? *Salmo carinatus* Cope, Hayden's Geol. Surv. Montana for 1871, p. 471.
1874—*Salmo utah* Suckley, Monograph Genus Salmo, p. 136, 1874.

A single head of this abundant species is in the collection. It is to all appearance entirely typical of what I call var. *aurora.*

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21201	1174	St. Mary's River....................	Dr. Elliott Coues......	Aug. 16, 1874.

Family ESOCIDÆ.

17.—Esox lucius Linnæus.

Common Pike.

SYNONYMY FOR EUROPEAN SPECIMENS.*

The Pike. Hecht. Brochet. Lucio or *Luzzo. Gädda* (Sweden).
Lucius, Belon, De Aquat. p. 296.—Rondel. ii, p. 188.—Salv. pp. 94, 95.—Schonev. p. 44.—Aldrov., De Pisc. p. 630.—Jonston, iii, t. 3, c. 5, t. 29, f. 1.—Gesner, De Pisc. p. 500.—Willugh. p. 236, tab. P, 5, f. 2.—Ray, Syn. p. 112.—Klein, Miss. Pisc. v, p. 74, tab. 20, f. 1.
Esox No. 1, Artedi, Synon. p. 26; Gen. p. 10, and spec. 53.—Gronov., Zoophyl. No. 361.
Esox lucius L., Syst. Nat. i, p. 516.—Bloch, Fische Deutschl. i, p. 229, t. 32; Bl. Schn. p. 390.—Lacépède, v, p. 297.—Reisinger, Prodr. Ichth. Hung. p. 47.—Donovan, Brit. Fishes, v, pl. 109.—Flem., Brit. An. p. 184.—Jurine, Mém. Soc. Phys. et Hist. Nat. Genève, iii, 1825, p. 231, pl. 15.—Ekström, Fische Mörko, p. 78.—Fries & Ekström, Scand. Fisk. p. 49, t. 10.—Nilss., Prodr. p. 36, and Scand. Faun. Fisk. p. 348.—Pall., Zoogr. Ross.-As. iii, p. 336.—Parnell, Wern. Mem. vii, p. 272.—Yarr., Brit. Fishes, 1st ed. 1, p. 383; 2d ed. 1, p. 434; 3d ed. 1, 343.—Sélys-Longch., Faune Belge, p. 223.—Cuv. & Val., xviii, p. 279.—Kröyer, Danm. Fisk. iii, p. 236.—Gronov., Syst. ed. Gray, p. 146.—Günther, Fische des Neckars, p. 107.—Rapp, Fische des Bodensees, p. 11.—Heckel & Kner, Süsswasserfische, p. 287.—Siebold, Süsswasserfische, p. 325.—Günther, Cat. Fishes Brit. Mus. vi, p. 226, and of all authors since Linnæus.

SYNONYMY FOR AMERICAN SPECIMENS.

1818—*Esox estor* Le Sueur, Journ. Acad. Nat. Sci. Phila. i, 413.
Esox estor Günther, Cat. Fishes Brit. Mus. vi, 228, 1867. (Excl. syn. pars. Not of Richardson, DeKay, and others, which is *E. nobilior* Thompson.)
Esox lucius var. *estor* Jordan, Man. Vert. 255, 1876.
Esox lucius var. *estor* Nelson, Bull. Ills. Mus. Nat. Hist. 1876.
Esox lucius estor Jordan & Copeland, Check List Fishes, 143, 1876.
1836—*Esox lucius* Richardson, Fauna Bor.-Am. iii, Fishes, 124.
Esox lucius ? DeKay, New York Fauna, Fishes, 226, 1842.
Esox lucius ? Storer, Synopsis Fishes N. A. 438, 1846.
Esox lucius Cope, Proc. Ac. Nat. Sc. Phila. 79, 1865.
Esox lucius Cope, Trans. Am. Philos. Soc. Phila. 408, 1866.
Esox lucius Günther, Cat. Fishes Brit. Mus. vi, 227, 1867.
Esox lucius Jordan, Bull. U. S. Nat. Mus. x, 55, 1877.
Esox lucius Jordan, Man. Vert. ed. 2d, 266, 1878.
Esox lucius Jordan, Bull. U. S. Geol. Surv. Terr. 432, 1878.

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* Copied from Günther, Cat. Fishes Brit. Mus. vi, p. 226, 1867.

1846—*Esox reticulatus* Kirtland, Bost. Journ. Nat. Hist. v, 233, pl. 10, f. 2. (Not of Le Sueur; first carefully distinguished from the Muskallunge.)
1846—? *Esox deprandus* (Le Sueur) Cuv. & Val. xviii, 336.
? *Esox deprandus* Cope, Proc. Ac. Nat. Sci. Phila. 79, 1865.
? *Esox deprandus* Cope, Trans. Am. Philos. Soc. 408, 1866.
? *Esox deprandus* Günther, Cat. Fishes Brit. Mus. vi, 2, 1867.
1850—*Esox boreus* Agassiz, Lake Superior, 317, 1850.
Esox lucioides Auct.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
21195	1076	Turtle Mountain	Dr. Elliott Coues	Aug. 10, 1873.
....	1176 (head)	St. Mary's River, Rocky Mountains	........do	Aug. 18, 1874.

The Common Pike is very abundant in all waters of Northern Asia, Northern Europe, and of North America north of about the latitude of the tributaries of Lake Erie, to Quincy, Ill., and northwestward to Alaska. It is one of the very few fresh-water fishes common to the eastern and western continents. I have carefully compared Swedish and American specimens, and I am unable to detect any specific differences whatever. No other strictly fresh-water species is known to be common to Europe and America. I have, however, little doubt of the identity of the American *Lota maculosa* (Le S.) with the European *Lota vulgaris* Cuv. In this case, the American species has the prior name.[*]

The number of nominal species of the genus *Esox* is greatly in excess of the number of definable forms. Those apparently worthy of recognition may be grouped in three subgeneric sections as follows:—

I. Mascalongus Jordan: Species of the largest size, with the branchiostegals in increased number (17 to 19), and the lower half of the cheeks and of the opercles bare of scales; coloration dark-spotted on a lighter ground. "Muskallunges."..*nobilior.*

II. Esox Linnæus: Species of large size, with the branchiostegals 15 or 16 in number; coloration pale-spotted on a darker ground; fins black-spotted. "Pikes." *lucius.*

III. Picorellus Rafinesque: Species of medium or small size, with the branchiostegals 12 to 15 in number; coloration reticulated or barred with dark green on a lighter ground or nearly plain. "Pickerels." *reticulatus, americanus, raveneli, cypho, salmoneus.*

Family ETHEOSTOMATIDÆ

Genus ALVORDIUS Girard.

18.—ALVORDIUS MACULATUS Girard.

Black-sided Darter.

1841—*Etheostoma blennioides* Kirtland, Boston Journ. Nat. Sci. iii, 348. (Not of Raf.)
Etheostoma blennioides Storer, Syn. Fishes N. A. 270, 1846.
Etheostoma blennioides Ag., Amer. Journ. Sci. Arts, 305, 1854.
Etheostoma blennioides Cope, Proc. Ac. Nat. Sci. Phila. 233, 1864.
Etheostoma blennioides Vaillant, Recherches sur les Poissons, etc. 70, 1873.

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[*] This conclusion has been already independently reached by Dr. T. H. Bean of the Smithsonian Institution.

1859—*Alvordius maculatus* GIRARD, Proc. Ac. Nat. Sci. Phila. 67.
1859—*Hadropterus maculatus* GIRARD, Proc. Ac. Nat. Sci. Phila. 100.
Etheostoma maculatum COPE, Am. Philos. Soc. 449, 1870.
Etheostoma maculatum VAILLANT, Recherches sur les Poissons, etc. 54, 1873.
Alvordius maculatus JORDAN, Man. Vert. 2d ed. 220, 1878.
Alvordius maculatus JORDAN, Bull. U. S. Geol. Surv. Terr. iv, 438, 1878.
1877—*Alvordius aspro* COPE & JORDAN, Proc. Ac. Nat. Sci. Phila. 51.
Alvordius aspro JORDAN, Bull. Nat. Mus. x, 14, 1877.

Numerous young specimens with the coloration obliterated, but not apparently different from ordinary Indiana specimens.

Smithsonian number.	Collector's number.	Locality.	Collector.	Date.
20193	....	....	Dr. Elliott Coues	....

ART. XXXIV.—CATALOGUE OF PHÆNOGAMOUS AND VASCULAR CRYPTOGAMOUS PLANTS COLLECTED DURING THE SUMMERS OF 1873 AND 1874 IN DAKOTA AND MONTANA ALONG THE FORTY-NINTH PARALLEL BY DR. ELLIOTT COUES U. S. A.: WITH WHICH ARE INCORPORATED THOSE COLLECTED IN THE SAME REGION AT THE SAME TIMES BY MR. GEORGE M. DAWSON.

BY PROF. J. W. CHICKERING.

[The present article is based primarily upon the collection of plants made by me during my connection with the United States Northern Boundary Commission. Those collected in 1873 were secured along the northern border of Dakota, in the valleys of the Red River of the North and of the Souris or Mouse River; and notably at Pembina, Dak. The collecting season of 1874 was along the northern border of Montana, and in the Rocky Mountains, at latitude 49° N.

With the species represented in my own collection, Professor Chickering has, at my suggestion, incorporated those procured by my colleague of the British contingent of the Survey, as published by Mr. Dawson in his report (8vo, Montreal, 1875, pp. 351–379); thereby presenting a fair idea of the flora of the belt of country surveyed by the Boundary Commission. The species not represented in my collection, but derived from Mr. Dawson's list, are marked with the asterisk (*).

For papers on other portions of my collections, see this Bulletin, this Vol., No. 1, pp. 259–292; No. 2, pp. 481–518; No. 3, pp. 545–661; No. 4, pp. 777–799.—ED.]

This catalogue comprises 692 species, besides quite a number of varieties, and is of much value and interest, not so much for the number of new species enumerated as for the information supplied respecting the range of many species known to be common farther east, west, or south.

A hasty comparison gives about 390 species found in New York or New England, about 80 distinctively Western in their habitat, and about 215 which belong on the plains and the Rocky Mountain region.

The *Leguminosæ* and the *Compositæ* are, of course, very largely represented, and exhibit a number of species peculiar to the region. The fact that but few collections were made previous to June will explain the absence of many spring flowers, which, from the character of the flora of summer, we should expect to find on that parallel.

Allium stellatum, Nutt., *Anemone Pennsylvanica*, L., and *Campanula rotundifolia*, L., var. *linifolia*, were noticed as so abundant on the prairie as to give character to the landscape.

Yucca angustifolia, Nutt., was collected along the Missouri River, probably reaching here its northern limit.

The species common to this region and the East show, for the most part, the effect of the drier climate and the scorching sun of the plains in smaller, thicker, more hirsute leaves.

Among the *Cactaceæ* but two species are found, *Mammillaria vivipara* and *Opuntia Missouriensis*, quite abundant along the central region, from 103° to 111° west longitude, limited very abruptly by increasing moisture of soil and climate.

Salicornia herbacea and *Rumex maritimus* suggest the saline character of the soil, and flourish as luxuriantly as if the sea still washed those inland shores.

The paucity in species of trees, excepting *Coniferæ*, is in striking contrast to the variety of the East, and may in part arise from the fact that so many trees are out of flower before the beginning of June.

The *Orchidaceæ* would naturally be poorly represented.

Carices and *Gramineæ* are quite abundant and interesting, while *Filices* make but a scanty display.

Doubtless a careful examination of certain localities through the entire season would add many species to the list, but the present catalogue serves very well to convey to the botanist a good idea of the characteristic flora of the 49th parallel.

RANUNCULACEÆ.

1. *Clematis verticillaris*, DC.
   1874. July, August. Frenchman's Creek to Rocky Mountains.
2. *Clematis ligusticifolia*, Nutt.
   1874. July. Along Frenchman's Creek.

*3. *Anemone alpina*, L.

*4. *Anemone multifida*, DC.

*5. *Anemone nemorosa*, L.

*6. *Anemone parviflora*, Mx.

7. *Anemone patens*, L., var. *Nuttalliana*, Gray.
   1873. July, August. Between Pembina and Mouse River. Apparently an autumnal inflorescence, the buds and flowers appearing with the mature leaves.
8. *Anemone Pennsylvanica*, L.
   1873. July. Pembina. Very abundant.
   1874. July. Prairie near Milk River.

*9. *Thalictrum cornuti*, L.

10. *Thalictrum dioicum*, L.
   1873. July. Pembina. Very common, on the prairie.
11. *Thalictrum purpurascens*, L.
   1873. July, August. Pembina and along Mouse River.

*12. *Ranunculus abortivus*, L.

*13. *Ranunculus affinis*, R. Br.
Ranunculus affinis, R. Br., var. *cardiophyllus*.
1873. July. Pembina.
14. *Ranunculus aquatilis*, L., var. *trichophyllus*.
1873. August, September. Mouse River.
14a. *Ranunculus aquatilis*, L., var. *capillaceus*.
1874. July. Frenchman's Creek.
15. *Ranunculus cymbalaria*, Pursh.
1873. July. Pembina. In company with *Lemna trisulca*.
1874. August. Rocky Mountains. On wet prairie.
*16. *Ranunculus Flammula*, L., var. *reptans*.
*17. *Ranunculus hispidus*, Mx.
*18. *Ranunculus Purshii*, Rich.
*19. *Ranunculus pygmæus*, Wehl.
20. *Ranunculus repens*, L.
1873. July. Pembina. Very hirsute.
1874. July. Frenchman's Creek.
*21. *Ranunculus rhomboideus*, Gold.
*22. *Myosurus minimus*, L.
*23. *Caltha palustris*, L.
*24. *Coptis trifolia*, Salisb.
*25. *Aquilegia Canadensis*, L.
*26. *Aquilegia flavescens*, Watson.
27. *Aquilegia vulgaris*, L., var. *brevistyla*.
1873. July. Pembina.
*28. *Delphinium azureum*, Mx.
29. *Actæa spicata*, L., var. *rubra*.
1873. July. Pembina and along Mouse River.
1874. August. Rocky Mountains. In fruit.

MENISPERMACEÆ.

*30. *Menispermum Canadense*, L.

BERBERIDACEÆ.

*31. *Berberis* (*Mahonia*) *aquifolium*, Pursh.

NYMPHACEÆ.

*32. *Nuphar advena*, Ait.

SARRACENIACEÆ.

*33. *Sarracenia purpurea*, L.

PAPAVERACEÆ.

*34. *Sanguinaria Canadensis*, L.

FUMARIACEÆ.

*35. *Corydalis glauca*, Pursh.
*36. *Corydalis aurea*, Willd.

CRUCIFERÆ.

*37. *Nasturtium palustre*, D. C.
*38. *Nasturtium tanacetifolium*, Hook.
*39. *Arabis hirsuta*, Scop.
40. *Arabis lyrata*, L.
1874. August. Base of Rocky Mountains. In fruit.
*41. *Arabis perfoliata*, Lam.
42. *Erysimum cheiranthoides*, L.
1873. July. Pembina.
1874. July. Missouri Coteau to Milk River.
43. *Erysimum asperum*, DC.
1874. July. Frenchman's Creek. In fruit.
43^{a}. *Erysimum asperum*, DC., var. *pumilum*.
1874. August. Near Milk River. With long pods, 4′.
*44. *Erysimum lanceolatum*, R. Br.
*45. *Sisymbrium brachycarpum*, Hook.
46. *Sisymbrium canescens*, Nutt.
1873. July. Between Pembina and Mouse River, on open prairie. A very canescent form.
47. *Stanleya pinnatifida*, Nutt.
1874. July. Frenchman's Creek.
*48. *Camelina sativa*, Crantz.
*49. *Capsella Bursa-pastoris*, Moench.
*50. *Thlaspi arvense*, L.
51. *Raphanus sativus*, L.
1873. July. Pembina.
*52. *Sinapis arvensis*, L.
*53. *Vesicaria didymocarpa*, Hook.
*54. *Vesicaria Ludoviciana*, DC.

CAPPARIDACEÆ.

55. *Cleome integrifolia*, T. & G.
1873. August. Mouse River.
1874. August. Milk River.
A very showy plant on dry sub-saline soil.
*56. *Polanisia graveolens*, Raf.

VIOLACEÆ.

*57. *Viola Canadensis*, L.
58. *Viola delphinifolia*, Nutt.
1873. July. Plains around Pembina.

*59. *Viola cucullata*, Ait.
60. *Viola pubescens*, Ait.
1873. July. Pembina. Woods.
*61. *Viola Nuttallii*, Pursh.
*62. *Viola pedata*, L.

DROSERACEÆ.

*63. *Drosera longifolia*, L.

HYPERICACEÆ.

*64. *Hypericum Scouleri*, Hook.

CARYOPHYLLACEÆ.

*65. *Silene antirrhina*, L.
*66. *Silene Douglasii*, Hook.
*67. *Silene longifolia*, Muhl.
68. *Arenaria lateriflora*, L.
1873. July. Pembina, in thickets.
69. *Arenaria stricta*, Mx.
1874. August. Milk River. In fruit.
*70. *Arenaria nardifolia*, Ledeb.
*71. *Arenaria pungens*, Nutt.
72. *Stellaria longifolia*, Muhl.
1873. July. Pembina.
*73. *Cerastium nutans*, Raf.
*74. *Cerastium oblongifolium*, Torr.

MALVACEÆ.

75. *Malvastrum coccineum*, Gray.
1873. August. Abundant along Mouse River on dry plains.
1874. July, August. Frenchman's Creek, Milk River.
76. *Sphæralcea acerifolia*, Nutt.
1874. August. Base of Rocky Mountains. In flower.

LINACEÆ.

77. *Linum perenne*, L.
1873. July, August, September. Common all the way on the plains from Pembina to Mouse River.
1874. Missouri Coteau to base of Rocky Mountains.
78. *Linum rigidum*, Pursh.
1874. July. Frenchman's Creek.

GERANIACEÆ.

*79. *Geranium Carolinianum*, L.
*80. *Geranium Fremontii*, Torr.

81. *Geranium Richardsonii*, F. & M.
    1874. August. Along Milk River.
81^a. *Geranium Richardsonii*, F. & M., var. ***incisum.***
    1874. July. Frenchman's Creek.

OXALIDACEÆ.

82. *Oxalis stricta*, L.
    1873. July. Pembina.

BALSAMINACEÆ.

*83. *Impatiens fulva*, Nutt.

ANACARDIACEÆ.

*84. *Rhus aromatica*, Gray.
85. *Rhus Toxicodendron*, L.
    1873. July. Pembina. In flower.
    1874. July. Missouri River.
*86. *Rhus glabra*, L.

VITACEÆ.

87. *Vitis cordifolia*, Mx., var. *riparia.*
    1873. July. Pembina. Thickets.
*88. *Ampelopsis quinquefolia*, Mx.

CELASTRACEÆ.

89. *Pachystima myrsinites*, Raf.
    1874. August. Base of Rocky Mountains.

RHAMNACEÆ.

*90. *Ceanothus velutinus*, Doug.
*91. *Rhamnus alnifolius*, L'Her.

SAPINDACEÆ.

*92. *Acer rubrum*, L.
93. *Negundo aceroides*, Moench.
    1874. July. Near Fort Buford. Sugar is often made from its sap.

POLYGALACEÆ.

94. *Polygala alba*, Nutt.
    1874. July. Prairie around Fort Buford.
*95. *Polygala polygama*, Walt.
*96. *Polygala Senega*, L.

LEGUMINOSÆ.

97. *Lupinus argenteus*, Pursh.
    1874. August. Base of Rocky Mountains.
98. *Hosackia Purshiana*, Benth.
    1874. June. Missouri River.

99. *Psoralea argophylla*, Pursh.
 1873. August. Dry prairie along Mouse River.
 1874. July. Missouri River.

*100. *Psoralea brachiata*, Doug.

101. *Psoralea hypogæa*, Nutt.
 1874. July. Milk River.

102. *Psoralea lanceolata*, Pursh.
 1874. July. Frenchman's Creek.

103. *Petalostemon candidus*, Mx.
 1873. July. Pembina.
 1874. June. Missouri River.

104. *Petalostemon violaceus*, Mx.
 1873. July. Pembina. Both this and the last species are very abundant on the dry prairie.
 1874. August. Frenchman's Creek.

105. *Amorpha canescens*, Nutt.
 1873. August. Open plains.

106. *Amorpha nana*, Nutt.
 1873. August. Plains near Turtle Mountain.

*107. *Astragalus aboriginorum*, Rich.

108. *Astragalus adsurgens*, Pall.
 1874. June. Prairie around Fort Buford.

109. *Astragalus bisulcatus*, Gray.
 1874. June. Prairie around Fort Buford.

*110. *Astragalus Bourganii*, Gray.

*111. *Astragalus cæspitosus*, Gray.

112. *Astragalus Canadensis*, L.
 1873. September. Along Mouse River. In fruit.

*113. *Astragalus caryocarpus*, Ker.

*114. *Astragalus flexuosus*, Doug.

115. *Astragalus hypoglottis*, L.
 1873. July. Plains near Pembina.

116. *Astragalus Missouriensis*, Nutt.
 1874. July. Missouri River.

117. *Astragalus pectinatus*, Doug.
 1874. July. Milk River.

118. *Astragalus pictus*, Gray.
 1874. June. Missouri River.

119. *Astragalus Purshii*, Doug.
 1874. July. Milk River. In fruit.

*120. *Astragalus tegetarius*, Watson.

121. *Oxytropis Lamberti*, Pursh.
 1874. June. Missouri River.

122. *Oxytropis splendens*, Dougl.
 1873. August. Dry prairie near Turtle Mountain. Leaflets strongly verticillate.
 1874. August. Milk River.

123. *Glycyrrhiza lepidota*, Nutt.
 1873. August. Along Mouse River.
 1874. July, August. Missouri River. Milk River.

124. *Hedysarum boreale*, Nutt.
 1874. August. Base of Rocky Mountains.

*125. *Desmodium Canadense*, D. C.

126. *Vicia Americana*, Muhl.
 1873. July. August, Pembina to Mouse River. Common in thickets and on the plains.
 1874. June. Missouri River.

127. *Lathyrus ochroleucus*, Hook.
 1873. August. Near Turtle Mountain. In thickets.

*128. *Lathyrus maritimus*, Big.

129. *Lathyrus venosus*, Muhl.
 1873. August. In company with preceding species.

130. *Thermopsis rhombifolia*, Nutt.
 1874. June. Missouri River.

ROSACEÆ.

*131. *Prunus Americana*, Marsh.

*132. *Prunus depressa*, Pursh.

*133. *Prunus Pennsylvanica*, L.

134. *Prunus Virginiana*, L.
 1873. August. Mouse River. In fruit. Used as food by the Indians.
 1874. July. Missouri River. In fruit.

135. *Spiræa salicifolia*, L.
 1873. July. Pembina. Forming thickets.
 1874. July. Milk River.

*136. *Spiræa betulifolia*, Pall.

137. *Agrimonia Eupatoria*, L.
 1873. August. Thickets.

138. *Dryas octopetala*, L.

*139. *Geum macrophyllum*, Willd.

*140. *Geum triflorum*, Pursh.

141. *Geum strictum*, Ait.
 1873. August. Near Turtle Mountain. With preceding.
 1874. August. Milk River.

*142. *Sibbaldia procumbens*, L.

143. *Potentilla anserina*, L.
 1873. July. Pembina.
 1874. July. Frenchman's Creek.

144. *Potentilla arguta*, Pursh.
 1873. July. Pembina. On prairie. Silky-pubescent.
 1874. August. Milk River.

145. *Potentilla fruticosa*, L.
1874. August. Milk River. Abundant.
*146. *Potentilla effusa*, Doug.
*147. *Potentilla glandulosa*, L.
148. *Potentilla gracilis*, Doug.
1873. August. Second prairie plateau.
1874. August. Frenchman's Creek.
*149. *Potentilla hippiana*, Lehm.
150. *Potentilla Norvegica*, L.
1873. July. Pembina.
1874. August. Frenchman's Creek.
*151. *Potentilla palustris*, Scop.
152. *Potentilla Pennsylvanica*, L.
1873. August. Second prairie plateau.
*153. *Potentilla tridentata*, Ait.
154. *Fragaria Virginiana*, Ehrh.
1873. July. Pembina.
1874. August. Sweetgrass Hills, abundant.
*155. *Fragaria vesca*, L.
156. *Rubus strigosus*, Mx.
1874. July. Frenchman's Creek. Thickets.
157. *Rubus triflorus*, Rich.
1873. July. Pembina.
*158. *Rubus Nutkanus*, Moc.
159. *Rosa blanda*, Ait.
1873. July. Pembina. Everywhere on the prairie, especially on the edges of woods along the streams.
160. *Cratægus tomentosa*, L., var. *punctata*.
1873. July. Pembina. In flower.—September. Along Mouse River. In fruit.
*161. *Cratægus coccinea*, L.
162. *Pyrus sambucifolia*, Ch. & Sch.
1874. August. Base of Rocky Mountains.
163. *Amelanchier Canadensis*, L., var. *alnifolia*.
1873. July. Pembina. In fruit.
1874. July. Milk River.

SAXIFRAGACEÆ.

164. *Ribes aureum*, Pursh.
1874. July. Missouri River. In fruit.
*165. *Ribes Cynosbati*, L.
166. *Ribes floridum*, L'Her.
1873. July. Pembina. In thickets.
167. *Ribes hirtellum*, Mx.
1874. July. Along Frenchman's Creek.
*168. *Ribes rotundifolium*, Mx.

*169. *Ribes rubrum*, L.
*170. *Parnassia Caroliniana*, L.
171. *Parnassia fimbriata*, Banks.
1874. August. Milk River.
172. *Parnassia palustris*, L.
1874. July. Frenchman's Creek.
*173. *Saxifraga bronchialis*, DC.
*174. *Saxifraga Eschscholtzii*, Sternb.
*175. *Saxifraga Dahurica*, Pall.
*176. *Saxifraga heteranthera*, Hook.
*177. *Saxifraga vernalis*, Willd.
*178. *Heuchera cylindrica*, Doug.
*179. *Heuchera Richardsonii*, R. Br.
*180. *Leptarrhena pyrolifolia*, Brown.
*181. *Mitella nuda*, L.
*182. *Mitella pentandra*, Hook.
*183. *Tiarella unifoliata*, Hook.

CRASSULACEÆ.

*184. *Sedum Rhodiola*, DC.
*185. *Sedum stenopetalum*, Pursh.

HALORAGEÆ.

186. *Myriophyllum spicatum*, L.
1874. August. Along branch of Milk River and all the prairie pools.

ONAGRACEÆ.

187. *Gaura coccinea*, Nutt.
1874. July. Frenchman's Creek.
188. *Circæa alpina*, L.
189. *Epilobium coloratum*, Muhl.
1873. August. Near Turtle Mountain.
*190. *Epilobium palustre*, L., var. *lineare*.
*190^a. *Epilobium palustre*, L., var. *albiflora*.
191. *Epilobium tetragonum*, L.
1874. July. Frenchman's Creek.
*192. *Epilobium origanifolium*, Lam.
193. *Epilobium angustifolium*, L.
1874. August. Branch of Milk River.
*194. *Epilobium latifolium*, L.
195. *Epilobium paniculatum*, L.
1873. August. Plains.
1874. August. Frenchman's Creek.
196. *Œnothera albicaulis*, Nutt.
1873. August. Mouse River.
1874. July. Missouri River.

*197. *Œnothera marginata*, Nutt.

198. *Œnothera biennis*, L.

1873. August. Dry plains between Pembina and Mouse River.

1874. July. Missouri River.

199. *Œnothera serrulata*, Nutt.

1873. August. With preceding species.

200. *Œnothera heterantha*, Nutt.

*201. *Œnothera leucocarpa*, Comien.

*202. *Œnothera pumila*, L.

LOASACEÆ.

203. *Mentzelia ornata*, Pursh.

1874. August. Base of Rocky Mountains.

CACTACEÆ.

204. *Mammillaria* (*Coryphantha*) *vivipara*, Haw.

1873. Extends eastward of the Missouri Coteau, in the valley of the Mouse River.

205. *Opuntia Missouriensis*, DC.

1873. September. Begins a little east of the Missouri Coteau, and is found all the way to the Rocky Mountains. Not in Red River Valley.

CUCURBITACEÆ.

206. *Echinocystis lobata*, T. & G.

UMBELLIFERÆ.

207. *Sanicula Marilandica*, L.

1873. July. Pembina.

*208. *Carum Gairdneri*, Benth. & Hook.

209. *Heracleum lanatum*, Mx.

1873. August. Dry prairie.

210. *Thaspium aureum*, Nutt.

1873. July. Pembina.

211. *Thaspium trifoliatum*, Gray.

1873. July. Pembina. Immature in open woods.

212. *Bupleurum ranunculoides*, L.

1874. August. Branch of Milk River.

213. *Cicuta virosa*, L.

1873. July. Pembina. This species exhibits forms running toward *C. maculata*.

1874. July. Frenchman's Creek.

214. *Cicuta maculata*, L.

*215. *Sium lineare*, Mx.

*216. *Osmorrhiza brevistylis*, DC.
217. *Osmorrhiza longistylis*, DC.
1873. July. Pembina.

ARALIACEÆ.

218. *Aralia nudicaulis*, L.
1873. July. Pembina. In woods.
*219. *Aralia hispida*, Mx.

CORNACEÆ.

*220. *Cornus Canadensis*, L.
*221. *Cornus paniculata*, L'Her.
222. *Cornus stolonifera*, Mx.
1873. July. Pembina. In flower.—August. Near Turtle Mountain. In fruit.
1874. July, August. Along river-bank.

CAPRIFOLIACEÆ.

*223. *Linnæa borealis*, Gron.
*224. *Symphoricarpus occidentalis*, R. Br.
1873. September. Mouse River. In fruit.—July. Pembina. In flowers. Occurring in masses in thickets.
1874. August. Sweetgrass Hills.
225. *Symphoricarpus racemosus*, Mx.
1874. August. Base of Rocky Mountains.
*226. *Lonicera involucrata*, Banks.
227. *Lonicera hirsuta*, Eaton.
1873. July. Pembina. In thickets.
*228. *Lonicera oblongifolia*, Muhl.
*229. *Lonicera parviflora*, Lam.
230. *Viburnum Lentago*, L.
1873. July. Pembina.
231. *Viburnum Opulus*, L.
1873. July. Pembina.
*232. *Diervilla trifida*, Mœnch.

RUBIACEÆ.

233. *Galium boreale*, L.
1873. July. Pembina. Very abundant on the prairie.
1874. June. Missouri River.—August. Rocky Mountains.
234. *Galium triflorum*, Mx.
1873. July. Pembina.
*235. *Galium trifidum*, L.
*236. *Houstonia ciliolata*, Torr.
*237. *Houstonia tenuifolia*, Nutt.

VALERIANACEÆ.

*238. *Valeriana sylvatica*, Rich.

COMPOSITÆ.

239. *Liatris punctata*, Hook.
1874. July. Prairie, near Frenchman's Creek.
240. *Liatris scariosa*, L.
1873. August. Second prairie.
241. *Brickellia grandiflora*, Nutt.
1874. August. Thickets. Milk River.
*242. *Eupatorium perfoliatum*, L.
243. *Eupatorium purpureum*, L.
1873. August. Thickets, on plains.
*244. *Nardosmia sagittata*, Pursh.
*245. *Aster carneus*, Nees.
246. *Aster lævis*, L.
1873. September. Mouse River, in thickets.
1874. August. Milk River.
*247. *Aster graminifolius*. Pursh.
248. *Aster Lamarckianus*, Nees.
1873. September. Mouse River.
*249. *Aster miser*, L.
*250. *Aster macrophyllus*, L.
251. *Aster multiflorus*, L.
1873. August. Mouse River Plain. Abundant. Specimens very rugose; leaves almost cuspidate.
252. *Aster ptarmicoides*, T. & G.
1873. August. Second prairie.
*253. *Aster salsuginosus*, Rich.
*254. *Aster tenuifolius*, L.
1873. August. Near Turtle Mountain.
*255. *Erigeron alpinum*, L.
*256. *Erigeron compositum*, Pursh.
257. *Erigeron glabellum*, Nutt.
1873. August. Mouse River Plain. Very abundant all over the prairie.
*258. *Erigeron Canadense*, L.
259. *Erigeron Philadelphicum*, L.
1873. July. Pembina.
*260. *Erigeron strigosum*, L.
261. *Erigeron pumilum*, Nutt.
1874. July. Prairies near Frenchman's Creek.
*262. *Machæranthera canescens*, Gray.
263. *Gutierrezia Euthamiæ*, T. & G.
1873. August. Mouse River, on dry plain.
1875. August. Frenchman's Creek.

*264. *Diplopappus umbellatus*, T. & G.

265. *Boltonia glastifolia*, L'Her.

    1873. September. Mouse River.

*266. *Solidago Canadensis*, L

267. *Solidago gigantea*, Ait.

    1873. July, August. From Pembina to Mouse River.
    1874. August. Milk River.

*268. *Solidago Virga-aurea*, L.

269. *Solidago Virga aurea*, L., var. *humilis*.

    1874. August. Rocky Mountains.

*270. *Solidago Virga-aurea*, L., var. *alpina*.

271. *Solidago incana*, T. & G.

    1874. August. Milk River.

*272. *Solidago lanceolata*, Ait.

*273. *Solidago nemoralis*, Ait.

274. *Solidago Missouriensis*, Nutt.

    1873. August. Mouse River.

*275. *Solidago stricta*, Ait.

*276. *Solidago serotina*, Ait.

277. *Solidago rigida*, L.

    1873. August. Open prairie. Very abundant.
    1874. August. Milk River.

*278. *Solidago tenuifolia*, Pursh.

*279. *Bigelovia graveolens*, Gr.

*280. *Bigelovia Howardii*, Gr.

281. *Aplopappus lanceolatus*, T. & G.

    1874. August. Milk River.

*282. *Aplopappus Nuttallii*, T. & G.

283. *Aplopappus spinulosus*, DC.

    1873. August. Mouse River. On very dry plains. Plant about six inches high.

284. *Grindelia squarrosa*, Dunal.

    1873. August. Mouse River.
    1874. August. Frenchman's Creek.
    Very abundant on the plains. Used by the Indians as an anti-syphilitic, in decoction.

285. *Chrysopsis villosa*, Nutt.

    1873. August. Dry plains.
    1874. July, August. Prairies along Missouri River.

Chrysopsis villosa, Nutt., var. *hispida*.

    1874. July. Missouri River.

*286. *Chrysopsis hispida*, Hook.

*287. *Iva axillaris*, Pursh.

288. *Ambrosia psilostachya*, DC.

    1873. August. Mouse River. On dry plains.

*289. *Ambrosia trifida*, L., var. *integrifolia*.

*290. *Xanthium echinatum*, Murr.
291. *Xanthium strumarium*, L.
1874. August. Along Missouri and Milk Rivers.
*292. *Heliopsis scabra*, Dun.
293. *Heliopsis lævis*, Pursh.
1873. July, August. Pembina and westward. Abundant.
*294. *Echinacea purpurea*, Moench.
295. *Echinacea angustifolia*, DC.
1873. August. Dry plains.
*296. *Rudbeckia fulgida*, Ait.
297. *Rudbeckia hirta*, L.
1873. July. Pembina. Dry plains, as at the East.
298. *Rudbeckia laciniata*, L.
1873. August. Mouse River Plain, in thickets.
299. *Lepachys columnaris*, T. & G.
1873. August. Mouse River. Very abundant on prairies.
*300. *Helianthus giganteus*, L.
301. *Helianthus petiolaris*, Nutt.
1874. August. Dry prairie, near base of Rocky Mountains.
*302. *Helianthus rigidus*, Desf.
303. *Bidens frondosa*, L.
1873. July. Pembina.
*304. *Bidens Beckii*, Torr.
*305. *Bidens chrysanthemoides*, Mx.
306. *Gaillardia aristata*, Pursh.
1873. August. Mouse River Plain.
1874. August. Prairies along Frenchman's Creek.
*307. *Gaillardia pinnatifida*, Torr.
308. *Gaillardia pulchella*, Foug.
1874. July, August. Dry prairies along Frenchman's Creek.
309. *Coreopsis tinctoria*, Nutt.
1874. August. Along Frenchman's Creek.
310. *Hymenopappus luteus*, Nutt.
1874. July. Prairie near Missouri River.
311. *Actinella Richardsonii*, Nutt.
1874. July. Along Missouri River.—August. Along Milk River.
*312. *Actinella acaulis*, Nutt.
313. *Helenium autumnale*, L.
1873. August. Mouse River. Slightly pubescent.
314. *Achillea millefolium*, L.
1873. July. Pembina.
1874. June. Fort Buford.
315. *Artemisia cana*, Pursh.
1874. July. Dry plains, Missouri River.

316. *Artemisia Canadensis*, Mx.
1873. August. Mouse River. On dry prairie.
1874. July. Frenchman's Creek.
*317. *Artemisia Douglasiana*, Bers.
318. *Artemisia frigida*, Willd.
1874. July. Branch of Milk River.
*319. *Artemisia discolor*, Doug.
*320. *Artemisia dracunculoides*, Pursh.
321. *Artemisia Ludoviciana*, Nutt.
1873. September. Mouse River. Dry prairie. One of the species known as "sage".
1874. August. Milk River.
*322. *Gnaphalium polycephalum*, Mx.
*323. *Antennaria alpina*, Gaertn.
*324. *Antennaria dioica*, var. *rosea*, Gaertn.
*325. *Antennaria plantaginifolia*, Hook.
*326. *Arnica angustifolia*, Vahl.
*327. *Arnica longifolia*, Eaton.
*328. *Arnica Menziesii*, Hook.
*329. *Amida hirsuta*, Nutt.
330. *Senecio aureus*, L.
1874. August. Rocky Mountains.
330ᵃ. *Senecio aureus*, L., var. *Balsamitæ*.
1873. July. Pembina.
*331. *Senecio canus*, Hook.
*332. *Senecio Fremontii*, T. & G.
333. *Senecio eremophilus*, Hook.
1873. August. Prairie.
*334. *Senecio lugens*, Rich.
*335. *Senecio resedifolius*, Lessing.
*336. *Senecio triangularis*, Hook.
*337. *Cirsium altissimum*, Spring.
*338. *Cirsium undulatum*, Spring.
1873. September. Missouri Coteau.
1874. June. Plains near Fort Buford.
*339. *Cirsium muticum*, Mx.
340. *Troximon glaucum*, Nutt.
1874. July. Along Missouri River.
340ᵃ. *Troximon glaucum*, Nutt., var.
In company with the typical form.
341. *Troximon cuspidatum*, Pursh.
1873. July. Pembina and westward, on prairies.
*342. *Stephanomeria minor*, Nutt.
343. *Hieracium Canadense*, Mx.
1873. July. Pembina, in thickets.
1874. August. Along branch of Milk River.

*344. *Hieracium albiflorum*, Hook.
345. *Hieracium scabrum*, Mx.
1873. July. Pembina.
346. *Hieracium Scouleri*, Hook.
1874. August. Near Rocky Mountains.
*347. *Hieracium triste*, Willd.
*348. *Hieracium venosum*, L.
349. *Nabalus albus*, Hook.
1873. August. Mouse River Plain.
*350. *Nabalus Boottii*, DC.
351. *Nabalus racemosus*, Hook.
1873. September. Along Mouse River.
352. *Lygodesmia juncea*, Don.
1873. September. Mouse River. Abundant westward.
1874. July, August. Along Missouri and Milk Rivers.
*353. *Crepis elegans*, Hook.
*354. *Macrorhynchus glaucus*, Torr.
355. *Macrorhynchus troximoides*, T. & G.
1873. July. Pembina.
*356. *Taraxacum Dens-leonis*, Desf.
*357. *Lactuca elongata*, Muhl.
*358. *Mulgedium acuminatum*, DC.
*359. *Mulgedium leucophæum*, DC.
360. *Mulgedium pulchellum*, Nutt.
1873. August. Mouse River Plain.
1874. July, August. Along Missouri and Milk Rivers.

LOBELIACEÆ.

*361. *Lobelia Kalmii*, L.
362. *Lobelia spicata*, Lam.
1873. August. Second prairie.

CAMPANULACEÆ.

*363. *Campanula aparinoides*, Pursh.
364. *Campanula rotundifolia*, L., var. *linifolia*.
1873. July. Pembina. Everywhere on the prairie.
1874. July. Frenchman's Creek.

ERICACEÆ.

*365. *Vaccinium myrtilloides*, Hook.
366. *Arctostaphylos Uva-ursi*, Spring.
1874. July, August. Base of Rocky Mountains.
*367. *Gaultheria procumbens*, L.
*368. *Cassandra calyculata*, L.
*369. *Andromeda polifolia*, L.

*370. *Menziesia glanduliflora*, Hook.
*371. *Menziesia Grahami*, Hook.
*372. *Ledum latifolium*, Ait.
*373. *Pyrola elliptica*, Nutt.
*374. *Pyrola secunda*, L.
*375. *Pyrola rotundifolia*, L.
*376. *Pyrola asarifolia*, Mx.
*377. *Moneses uniflora*, Gray.
*378. *Monotropa uniflora*, L.

PLANTAGINACEÆ.

379. *Plantago eriopoda*, Torr.
1874. July. Dry prairie. Missouri River.
380. *Plantago Patagonica*, Jacq.
1874. July. Missouri River.
381. *Plantago Patagonica*, var.
With preceding.
*382. *Plantago major*, L.
*383. *Plantago Bigelovii*, Gray.

PRIMULACEÆ.

*384. *Androsace occidentalis*, Pursh.
*385. *Androsace septentrionalis*, L.
*386. *Dodecatheon integrifolium*, Mx.
*387. *Glaux maritima*, L.
388. *Lysimachia ciliata*, L.
1873. July, August. Pembina and westward, on the borders of thickets.
1874. July, August. Frenchman's Creek to Rocky Mountains.
*389. *Lysimachia thyrsifolia*, L.
*390. *Trientalis Americana*, Pursh.

LENTIBULACEÆ.

391. *Utricularia vulgaris*, L.
1874. August. Frenchman's Creek. Swamp.

SCROPHULARIACEÆ.

*392. *Chelone glabra*, L.
*393. *Pentstemon acuminatus*, Doug.
*394. *Pentstemon confertus*, Doug.
*395. *Pentstemon dasyphyllus*.
396. *Pentstemon gracilis*, Nutt.
1873. August. Dry prairie.
*397. *Pentstemon glaucus*, Grah.
*398. *Pentstemon Menziesii*, Hook.

*399. *Pentstemon procerus*, Doug.
*400. *Pentstemon pubescens*, Soland.
401. *Mimulus luteus*, L.
1874. August. Milk River.
*402. *Mimulus Lewisii*, Pursh.
*403. *Mimulus ringens*, L.
*404. *Gratiola Virginiana*, L.
*405. *Veronica Americana*, Schwein.
1874. August. Milk River.
*406. *Veronica alpina*, L.
*407. *Veronica peregrina*, L.
*408. *Gerardia purpurea*, L.
*409. *Castilleia coccinea*, Spring.
410. *Castilleia pallida*, Kunth.
1874. August. Base of Rocky Mountains.
410^a. *Castilleia pallida*, Kunth., var. *miniata*.
1874. August. Milk River.
*411. *Castilleia sessiliflora*, Ph.
*412. *Rhinanthus Crista-Galli*, L.
*413. *Pedicularis Canadensis*, L.
*414. *Pedicularis bracteosa*, Benth.
*415. *Melampyrum Americanum*, Mx.
416. *Orthocarpus luteus*, Nutt.
1874. July. Near Three Buttes.

VERBENACEÆ.

417. *Verbena bracteosa*, Mx.
1874. July. Frenchman's Creek.
*418. *Verbena hastata*, L.

LABIATÆ.

419. *Mentha Canadensis*, L.
1873. August. Along Mouse River.
1874. August. Frenchman's Creek.
*420. *Lycopus sinuatus*, Gray.
*421. *Lycopus Virginicus*, L.
422. *Monarda fistulosa*, L.
1873. August. Turtle Mountain.
422^a. *Monarda fistulosa*, var. *mollis*.
1874. August. Frenchman's Creek.
423. *Lophanthus anisatus*, Benth.
1873. August. Near Turtle Mountain.
424. *Dracocephalum parviflorum*, Nutt.
1873. August. Turtle Mountain.
*425. *Physostegia Virgiana*, Benth.

*426. *Brunella vulgaris*, L.
*427. *Scutellaria galericulata*, L.
*428. *Galeopsis Tetrahit*, L.
429. *Stachys aspera*, Mx.
1873. July. Pembina.
430. *Stachys palustris*, L.
1874. July. Missouri River and Frenchman's Creek.

BORRAGINACEÆ.

*431. *Onosmodium Virginianum*, DC.
432. *Lithospermum canescens*, Lehm.
1873. July. Pembina. Dry plains.
*433. *Lithospermum longiflorum*, Spreng.
*434. *Mertensia paniculata*, Don.
435. *Eritrichium Californicum*, DC.
1874. July. Frenchman's Creek.
436. *Eritrichium crassisepalum*, T. & G.
1874. August. Dry plains. Base of Rocky Mountains.
437. *Eritrichium leucophæum*, DC.
1874. August. Base of Rocky Mountains.
*438. *Eritrichium glomeratum*, DC.
*439. *Myosotis alpestris*, Schmidt.
*440. *Echinospermum floribundum*, Lehm.
*441. *Echinospermum Lappula*, Lehm.
*442. *Echinospermum patulum*, Lehm.
443. *Cynoglossum Virginicum*, L.
1873. July, August. Pembina and westward.

POLEMONIACEÆ.

444. *Phlox Douglassii*, Hook.
1874. July. Near Three Buttes.
*445. *Phlox canescens*, T. & G.
*446. *Phlox pilosa*, L.
447. *Collomia linearis*, Nutt.
1874. July. Dry prairies, Missouri River.
448. *Gilia minima*, Gr.
1874. July. Near Three Buttes.

CONVOLVULACEÆ.

449. *Calystegia sepium*, R. Br.
1873. July. Pembina.
1874. July. Missouri River.
450. *Calystegia spithamæa*, Pursh.
1873. July. Pembina, in woods.
1874. July. Missouri River.
451. *Cuscuta Gronovii*, Willd.
1873. August. Turtle Mountain. On *Ribes rotundifolium*.

SOLANACEÆ.

*452. *Physalis viscosa*, L.
453. *Solanum rostratum*, Dunal.
1874. July. Frenchman's Creek.
454. *Solanum triflorum*, Nutt.
1874. July. Prairies, Frenchman's Creek.

GENTIANACEÆ.

*455. *Halenia deflexa*, Griseb.
456. *Gentiana affinis*, Griseb.
1874. August. Milk River.
457. *Gentiana Amarella*, L.
1874. August. Rocky Mountains.
*458. *Gentiana acuta*, Mx.
*459. *Gentiana Andrewsii*, Griseb.
*460. *Gentiana crinita*, Froel.
*461. *Gentiana detonsa*, Fries.
*462. *Gentiana Menziesii*, Griseb.
463. *Gentiana puberula*, Mx.
1873. September. Mouse River.

APOCYNACEÆ.

464. *Apocynum androsæmifolium*, L.
1873. July. Pembina, in thickets.
465. *Apocynum cannabinum*, L.
1873. July. Very abundant in thickets. The fibre used by the Indians for cordage. It may eventually have some economic value.
1874. July. Missouri River.

ASCLEPIADACEÆ.

466. *Asclepias ovalifolia*, Dec.
1873. July. Pembina, in woods.
467. *Asclepias speciosa*, Torr.
1873. August. Plains near Turtle Mountain.
1874. July. Wet places along Frenchman's Creek.
468. *Asclepias verticillata*, L.
1873. July. Pembina.
*469. *Asclepias incarnata*, L.
*470. *Asclepias variegata*, L., var. *minor*, Hook.
*471. *Asclepias viridiflora*, Ell.

ARISTOLOCHIACEÆ.

*472. *Asarum Canadense*, L.

NYCTAGINACEÆ.

473. *Oxybaphus hirsutus*, Sweet. Var.
1874. July. Missouri River.

*474. *Oxybaphus nyctagineus*, Sweet.

CHENOPODIACEÆ.

*475. *Chenopodium album*, L.

476. *Chenopodium leptophyllum.*
1874. August. Dry plains west of Frenchman's Creek.

*477. *Blitum Bonus-Henricus*, L.

*478. *Blitum capitatum*, L.

479. *Blitum glaucum*, Koch.
1874. August. Milk River.

480. *Atriplex Nuttallii*, Watson.
1874. July. Missouri River.

481. *Atriplex Endolepis*, Watson.
1874. August. Frenchman's Creek.

*482. *Salicornia herbacea*, L.

483. *Suæda depressa*, Ledeb.
1873. July. Pembina, dry plains.

484. *Sarcobatus vermiculatus*, Torr.
1874. July. Saline soil. West of Frenchman's Creek.

AMARANTACEÆ.

*485. *Amarantus retroflexus*, L.

PARONYCHIÆ.

486. *Paronychia sessiliflora*, Nutt.
1873. September. Along Mouse River, on dry banks.
1874. August. Milk River.

POLYGONACEÆ.

487. *Polygonum amphibium*, L.
1874. July. Frenchman's Creek.

*487^a. *Polygonum amphibium*, L., var. *terrestre.*

487^b. *Polygonum amphibium*, L., var. *aquaticum.*
1873. August. Mouse River Plain, in wet places.

*488. *Polygonum aviculare*, L.

488^a. *Polygonum aviculare*, L., var. *erectum.*
1874. August. Base of Rocky Mountains.

*489. *Polygonum cilinode*, Mx.

*490. *Polygonum dumetorum*, L.

*491. *Polygonum hydropiperoides*, Mx.

492. *Polygonum lapathifolium*, Ait., var. *incanum.*
1874. August. Frenchman's Creek.

*493. *Polygonum Pennsylvanicum*, L.

*494. *Polygonum tenue*, Mx.

*495. *Oxyria digyna*, Campd.

496. *Rumex maritimus*, L.
   1874. August. Saline plains, west of Frenchman's Creek.

497. *Rumex salicifolius*, Weinm.
   1873. July. Pembina.
   1874. June, July. Missouri River. Frenchman's Creek.

498. *Rumex venosus*, Pursh.
   1874. July, August. Frenchman's Creek and westward.

499. *Eriogonum flavum*, Nutt.
   1874. July, August. Missouri River to Rocky Mountains.

500. *Eriogonum umbellatum*, Torr.
   1874. July. Frenchman's Creek.

*501. *Eriogonum crassifolium*, Benth.

ELÆAGNACEÆ.

502. *Elæagnus argentea*, Pursh.
   1873. August. Vicinity of Turtle Mountain, very common in patches.

*503. *Shepherdia argentea*, Nutt.

*504. *Shepherdia Canadensis*, Nutt.

SANTALACEÆ.

505. *Comandra pallida*, DC.
   1874. June, July. Missouri River.

506. *Comandra umbellata*, Nutt.
   1873. July. Pembina.

EUPHORBIACEÆ.

*507. *Euphorbia glyptosperma*, Engl.

URTICACEÆ.

508. *Humulus Lupulus*, L.
   1873. August, September. Turtle Mountain to Mouse River.

509. *Urtica gracilis*, Ait.
   1873. August. Second prairie.
   1874. August. Frenchman's Creek.

510. *Laportea Canadensis*, Gaudich.
   1873. July. Pembina.

511. *Ulmus Americana*, L.
   1873. June. Pembina.

CUPULIFERÆ.

*512. *Corylus Americana*, Walt.

513. *Quercus macrocarpa*, Mx.
   1873. Pembina, common, of large size along the river.

BETULACEÆ.

514. *Betula occidentalis*, Hook.
1874. August. Rocky Mountains.

SALICACEÆ.

515. *Salix lucida*, Muhl.
1873. August. Mouse River.
516. *Salix rostrata*, Richardson.
1873. July. Pembina, in fruit.
*517. *Salix nigra*, Marsh.
*518. *Populus balsamifera*, L., var. *candicans*.
*519. *Populus monilifera*, Ait.
*520. *Populus tremuloides*, Mx.

CONIFERÆ.

*521. *Pinus Banksiana*, Lambert.
*522. *Pinus contorta*, Doug.
*523. *Pinus resinosa*, Ait.
524. *Abies Douglasii*, Lindl.
1874. Rocky Mountains.
*525. *Abies alba*, Mx.
*526. *Abies Engelmanni*, Parry.
*527. *Abies nigra*, Torr.
*528. *Abies balsamea*, Marshall.
*529. *Larix Americana*, Mx.
*530. *Thuja occidentalis*, L.
531. *Juniperus communis*, L.
1874. August. Rocky Mountains.
532. *Juniperus Sabina*, L.
1874. August. Base of Rocky Mountains.
*533. *Juniperus Virginiana*, L., var. *procumbens*.

ARACEÆ.

534. *Arisæma triphyllum*, Torr.
1873. July. Pembina.
*535. *Calla palustris*, L.
*536. *Acorus Calamus*, L.

LEMNACEÆ.

537. *Lemna trisulca*, L.
1873. Pembina, with *Ranunculus cymbularia*.
*538. *Lemna minor*, L.

TYPHACEÆ.

*539. *Typha latifolia*, L.
540. *Sparganium simplex*, Huds.
1873. July. Pembina.
*541. *Sparganium eurycarpum*, Eng.
*542. *Sparganium natans*, L.

NAIDACEÆ.

543. *Potamogeton pectinatus*, L.
1873. August. Near Turtle Mountain.
544. *Potamogeton marinus*, L.
1873. August. Near Turtle Mountain.
*545. *Potamogeton natans*, L.
546. *Potamogeton perfoliatus*, L., var. *lanceolatus*.
1874. August. Near Turtle Mountain.
*547. *Potamogeton pusillus*, L.

ALISMACEÆ.

548. *Alisma Plantago*, L.
1874. July. Frenchman's Creek.
*549. *Triglochin maritimum*, L.
*550. *Triglochin palustre*, L., var. *elatum*.
551. *Sagittaria variabilis*, Eng.
1873. August. Mouse River.
1874. July. Frenchman's Creek.

ORCHIDACEÆ.

552. *Habenaria hyperborea*, R. Br.
1874. August. Rocky Mountains.
*553. *Habenaria bracteata*, R. Br.
*554. *Habenaria psycodes*, Gray.
*555. *Spiranthes cernua*, Rich.
*556. *Calopogon pulchellus*, R. Br.
*557. *Cypripedium pubescens*, Willd.

AMARYLLIDACEÆ.

*558. *Hypoxis erecta*, L.

IRIDACEÆ.

*559. *Iris versicolor*, L.
560. *Sisyrinchium Bermudiana*, L., var. *anceps*.
1873. July. Pembina.
*561. *Sisyrinchium mucronatum*, Mx.

SMILACEÆ.

562. *Smilax herbacea*, L.
1873. July. Pembina.

LILIACEÆ.

563. *Zygadenus glaucus*, Nutt.
1873. July. Pembina.
564. *Zygadenus Nuttallii*, Gray.
1874. June. Prairie along Missouri River.

*565. *Veratrum album*, var. *Eschscholtzii*, Gray.
*566. *Xerophyllum tenax*, Pursh.
*567. *Tofieldia glutinosa*, Willd.
568. *Prosartes trachycarpa*, Watson.
1874. August. Rocky Mountains.
569. *Clintonia uniflora*, Menz.
1874. August. Rocky Mountains.
*570. *Smilacina bifolia*, Ker.
571. *Smilacina trifolia*, Desf.
1873. July. Pembina, in woods.
572. *Smilacina racemosa*, Desf.
1874. August. Rocky Mountains.
573. *Smilacina stellata*, Desf.
1873. July. Pembina.
1874. June. Fort Buford.
574. *Polygonatum giganteum*, Dietrich.
1873. July. Pembina, shady bank of the river.
575. *Lilium Philadelphicum*, L.
1873. June, July. Pembina. Very abundant on the prairie.
576. *Calochortus Nuttallii*, T. & G.
1874. June. Fort Buford.
577. *Allium cernuum*, Roth.
1874. August. Base of Rocky Mountains.
578. *Allium Schœnoprasum*, L.
1874. August. Rocky Mountains.
579. *Allium stellatum*, Nutt.
1873. August. Mouse River Plain. Very abundant.
*580. *Allium reticulatum*, Frazer.
581. *Yucca angustifolia*, Nutt.
1874. July. Missouri River.

JUNCACEÆ.

*582. *Juncus acuminatus*, Mx.
*583. *Juncus alpinus*, var. *insignis*, Fries.
584. *Juncus Balticus*, Deth.
1873. July. Pembina.
*584^a. *Juncus Balticus*, Deth., var. *montanus*.
*585. *Juncus Mertensianus*, Doug.
*586. *Juncus nodosus*, L.
*587. *Juncus xiphioides*, E. Mayer.
*588. *Luzula parviflora*, Desv., var. *melanocarpa*.

COMMELYNACEÆ.

589. *Tradescantia Virginica*, L.
1874. June. Prairies near Fort Buford.

CYPERACEÆ.

*590. *Eleocharis acicularis*, R. Br.
591. *Eleocharis palustris*, R. Br.
1873. August. Mouse River Plain.
1874. July. Missouri River.
*592. *Scirpus Eriophorum*, Mx.
593. *Scirpus fluviatilis*, Gray.
1873. July. Pembina.
594. *Scirpus maritimus*, L.
1873. August. Vicinity of Turtle Mountain.
1874. July. Missouri River.
595. *Scirpus pungens*, Vahl.
1874. July. Missouri River.
596. *Scirpus validus*, Vahl.
1873. July. Pembina.
1874. July. Missouri River.
*597. *Eriophorum latifolium.*
*598. *Eriophorum polystachyon*, L.
*599. *Carex adusta*, Boot.
1873. July. Pembina.
*600. *Carex alopecoidea*, Tucker.
*601. *Carex aperta*, Boot.
602. *Carex aristata*, R. Br.
1873. July. Pembina.
*603. *Carex atrata*, L.
*604. *Carex aurea*, Nutt.
*605. *Carex Douglasii*, Hook.
*606. *Carex festiva*, Dew.
*607. *Carex lanuginosa*, Mx.
1874. July. Missouri River.
*608. *Carex longirostris*, Torr.
*609. *Carex lupulina*, Muhl.
*610. *Carex marcida*, Boott.
*611. *Carex polytrichoides*, Muhl.
*612. *Carex Pseudo-Cyperus*, L.
613. *Carex retrorsa*, Schw.
1873. August. Mouse River.
*614. *Carex rosea*, Schk.
*615. *Carex Richardsonii*, R. Br.
*616. *Carex rigida*, Good.
*617. *Carex riparia*, Curtis.
*618. *Carex scirpoidea*, Mx.
*619. *Carex siccata*, Dew.
*620. *Carex straminea*, Schk.
*621. *Carex straminea*, Schk., var.
1873. July. Pembina.

*622. *Carex supina*, Wahl.
*623. *Carex stricta*, Lam.
*624. *Carex stenophylla*, Wahl.
*625. *Carex utriculata*, Boott.

GRAMINEÆ.

*626. *Zizania aquatica*, L.
*627. *Alopecurus alpinus*, Smith.
*628. *Phleum alpinum*, L.
*629. *Agrostis scabra*, Willd.
630. *Calamagrostis Canadensis*, Beauv.
1873. July, August. Pembina. Near Turtle Mountain.
631. *Calamagrostis stricta*, Trin. Var.
1873. August. Turtle Mountain.
1874. July. Frenchman's Creek.
*632. *Eriocoma cuspidata*, Nutt.
633. *Stipa comata*, Trin.
1873. August. Turtle Mountain.
634. *Stipa spartea*, Trin.
1874. July. Frenchman's Creek.
635. *Stipa viridula*, Trin.
1873. August. Second prairie.
1874. July. Frenchman's Creek.
636. *Spartina cynosuroides*, Willd.
1873. August. Mouse River.
637. *Spartina gracilis*, Roth.
1873. July. Turtle Mountain.
1874. July. Frenchman's Creek.
638. *Bouteloua oligostachya*, Torr.
1873. August. Turtle Mountain westward, forming compact sod, on dry prairie.
639. *Kœleria cristata*, Pers.
1873. August. Second prairie.
1874. July. Frenchman's Creek.
640. *Glyceria airoides*, Thurber.
1874. July. Missouri River.
*641. *Glyceria nervata*, Trin.
*642. *Catabrosa aquatica*, Beauv.
*643. *Poa alpina*, L.
644. *Poa alsodes*, Gray.
1873. July. Pembina.
*645. *Poa cæsia*, Smith, var. *strictior.*
646. *Poa compressa*, L.
1873. July. Pembina.
*647. *Poa flexuosa*, Muhl.
*648. *Poa pratensis*, L.

649. *Poa serotina*, Ehrh.
1873. July, August. Pembina. Turtle Mountain.
*650. *Festuca borealis*, Mert.
*651. *Festuca ovina*, L.
652. *Bromus ciliatus*, L.
1873. August. Mouse River.
1874. August. West of Frenchman's Creek.
653. *Phragmites communis*, Trin.
1873. August. Prairie, on borders of little pools.
*654. *Lepturus paniculatus*, Nutt.
655. *Triticum caninum*, L.
1873. August. Near Turtle Mountain, in thickets.
656. *Triticum repens*, L.
1874. July. Frenchman's Creek.
*657. *Triticum strigosum*, Steud.
658. *Hordeum jubatum*, L.
1873. July. Pembina, on prairie.
1874. July. Missouri River.
659. *Hordeum pratense*, Huds.
1874. August. West of Frenchman's Creek.
660. *Elymus Canadensis*, L.
1873. August. Turtle Mountain, thickets.
*661. *Elymus Canadensis*, var. *glaucifolius*.
662. *Elymus Sibiricus*, L.
1874. August. Rocky Mountains.
663. *Elymus Virginicus*, L.
1873. August. Near Turtle Mountain.
*664. *Danthonia spicata*, Beauv.
*665. *Avena striata*, Mx.
666. *Aira cæspitosa*, L.
1874. August. Base of Rocky Mountains.
667. *Phalaris arundinacea*, L.
1873. July, August. Pembina. Turtle Mountain, thickets.
1874. July. Frenchman's Creek.
*668. *Hierochloa borealis*, R. & G.
669. *Beckmannia erucæformis*, Host.
1874. July, August. Missouri River. Frenchman's Creek.
*670. *Panicum pauciflorum*, Ell.
671. *Panicum virgatum*, L.
1873. August. Mouse River.
*672. *Andropogon furcatus*, Muhl.
673. *Andropogon scoparius*, Mx.
1873. September. Mouse River, dry prairie.

EQUISETACEÆ.

674. *Equisetum arvense*, L.
1873. July. Pembina.

*675. *Equisetum hyemale*, L.
*676. *Equisetum lævigatum*, Braun.
*677. *Equisetum limosum*, L.
678. *Equisetum robustum*, Braun.
1874. June. Missouri River.

FILICES.

*679. *Polypodium vulgare*, L.
*680. *Phegopteris Dryapteris*, Fee.
*681. *Aspidium Lonchitis*, Swz.
*682. *Aspidium spinulosum*, Willd.
*683. *Onoclea sensibilis*, L.
*684. *Cystopteris bulbifera*, Bernh.
*685. *Cystopteris fragilis*, Bernh.
*686. *Woodsia Ilvensis*, R. Br.
*687. *Botrychium lunarioides*, Swz.
*688. *Botrychium Virginicum*, Swz.

LYCOPODIACEÆ.

*689. *Lycopodium complanatum*, L.
*690. *Lycopodium lucidulum*, Mx.
691. *Selaginella rupestris*, Spreng.
1874. August. Base of Rocky Mountains, and almost anywhere eastward, in some places covering the face of the country and forming much of the sod on sterile hills.

LICHENES.

692. *Evernia alpina*.
1874. August. Rocky Mountains.

ART. XXXV.—ON SOME STRIKING PRODUCTS OF EROSION IN COLORADO.

BY F. M. ENDLICH, S. N. D.

During the progress of the geological and geographical survey of Colorado, under the direction of Dr. F. V. Hayden, every portion of that interesting State was explored. Numerous data were obtained, important not only to the geologist, but furnishing ample material to the artist, enjoyment to the traveller. Few States, perhaps, are so well favored by nature as Colorado. Some of the grandest mountain scenery within the United States is there to be found; mineral wealth is treasured up within the earth's interior. Farms and meadow land, rich in their yield, are scattered throughout the State; and, again, the traveller may visit within this State regions that will forcibly remind him of the Sahara. Now that its exploration is finished and its features throughout are thoroughly known, we are enabled to present more connected discussions upon the characteristic forms there observed. No group of forms, probably, is so unique as that showing numberless changes produced by the sculpturing hand of nature. Erosion, its artistic agent, has furnished us, in Colorado, with results at once striking and singularly beautiful in detail. To these the following pages shall be devoted. Fully aware that no pen-picture can convey an adequate idea of the subject, I may still hope that an accurate description may be of some service to those seeking information thereupon.

For many years the classical region of Monument Park has been known. The singular shapes of its rocks and brilliancy of their colors have given a justly earned celebrity to the place. Since that time many other localities have been discovered, some of them even surpassing the former in grandeur and beauty. Lying farther toward the interior of the State, the regular tourist has not yet reached these spots, and the revelation of their wonders has thus far been made to a favored few only. In the course of years, no doubt, as communications shall be more completely established, these places, too, will be visited, and will elicit admiration equal to that now bestowed upon Monument Park. Until that time arrives, however, descriptions must be accepted which cannot possibly do justice to the subject.

EROSION.

Two classes of erosive agents may be distinguished, *chemical* and *physical*. Of these, the former has but one function, the latter two.

Chemical agents produce such changes in the rock as may, and most frequently do, result in its partial or complete decomposition. This decomposition is the destruction of original and the consequent formation of new compounds. Very often it is accompanied by an increase of volume, whereby the original molecular cohesion is disturbed. On the other hand, it may result in the removal of certain constituents, thus producing an effect directly inverse to the former. By either of these processes, the mass is disturbed in such a manner as to render it less impregnable to the attacks of physical erosives. Although we cannot have, therefore, a truly chemical erosion in all instances, we are justified in using the term, because the chemical action is the immediate means by virtue of which the mechanical work may be accomplished.

Most prominent among the chemical agents facilitating mechanical erosion are water, either pure or charged with various gases, and growing vegetation. Minerals like feldspar, anhydrite, and others absorb water, and are changed into caolinite and gypsum respectively. Both of these secondary products are less able to withstand erosion than the original compounds. This represents the case where changes of chemical composition prepare the material in such a manner as to offer the least resistance to physical erosives. Water charged with gases, more particularly carbonic acid gas, will dissolve certain compounds readily and carry away portions thereof in solution. Hot and cold water, pure, will act in the same manner, but to a less degree. Growing vegetation will chemically absorb certain ingredients of rocks upon which its roots may be resting, thus either directly removing small quantities of the material or changing its chemical composition. This erosive action by vegetation becomes insignificant, however, when compared with the far superior physical force growing plants exhibit. Gases contained in the atmosphere have some effect upon rocks of varying constitution, but frequently one that tends rather to preserve than to destroy the material acted upon. Oxydation is the most widely distributed result of such influence.

Most prominent among the agents of physical or mechanical erosion is the action of water, wind, and growing vegetation. Again, we find that by vegetation the subsequent absolute removal of material is prepared. The growth of roots in minute crevices of rocks may frequently result in a disruption of the cohesion, thus either directly removing a fragment or placing it into such a position as to make its removal imminent. To every one is known the enormous expansive power of growing roots, and it will readily be seen how very severely a large mass of them may affect a rock that has, for instance, the physical constitution of a sandstone.

Flowing water, with or without sand and detritus in suspension, is one of the most directly acting agents, and is productive of results upon a grand scale. Analogous thereto, though more restricted in occurrence, is the action of moving ice. Precipitated water presents results similar to the foregoing, but on a small scale. Water entering fissures and seams, or saturating porous rocks, severely affects them by expansion incident upon freezing. Within certain classes of rocks, this process, preparatory to the final removal of material, is one of great importance. Not only are those that may be regarded as mechanical deposits thereby affected, but also the crystalline aggregates. Water entering minute openings between the cleavage-planes of crystals will gradually produce a separation so great as to render the original position of the crystal no longer tenable. This mode of separation is analogous, in its results, to the effects produced by growing roots. For flowing and precipitated water is reserved the ultimate transportation of such loosened material from its original place of occurrence.

Wind, finally, is the last of the important agents of erosion. By its force, small, loosened particles are removed and are carried away. Sand carried before the wind is capable of producing very marked results. By the frequent repetition and violence of the concussions caused by grains of sand striking against some fixed obstacle, a type of erosion is produced that may be regarded as unique in its detail characteristics. While the cutting action of the sand detaches fragments of the rock, the wind rapidly carries them off, thus ever offering fresh surfaces to the attacks of the rapidly abrading material. The comparatively small amount of work that is apparently accomplished by this powerful factor of erosive agents may be due to the fact that peculiar positions of the eroded material are required. Unless these conditions be complied with, the sand will speed harmlessly upon its way, or produce such results as furnish no adequate examples of its power.

Reviewing, briefly, the characteristics resulting from the various methods of erosion, we observe that certain analogous physical causes produce essentially the same forms. Water acts as a solvent agent upon many of the minerals constituting rocks. Although the quantity of mineral matter taken into solution by pure water is, as a rule, indefinitely small, the presence of carbonic acid gas makes a great difference in its solvent power. Frequently exposures of limestones may be seen, exhibiting a minutely corrugated surface. Gypsum is affected in the same way by chemical aqueous erosion. Admixtures of silex and clay in either limestones or gypsum produce definite results, which lead to a recognition of their presence. Although the chemical erosion caused by growing vegetation in the aggregate will show extensive results, its direct evidence is not very manifest. Owing to the distribution of minute root-fibers, their chemical action is spread so uniformly that it can be recognized as such only in rare instances.

Perhaps the most universally observed products of erosion are those shaped by flowing water. Channels are worn into yielding rocks, rough places are smoothed, soft inclosures in hard rocks are removed, and, throughout, the outlines are modified. These results are, in a great measure, dependent upon the quantity and quality of the material which the water may carry in suspension. Moving ice and its accompanying mass of detritus manifests the same ultimate achievements. Hard, resisting rocks are smoothed and planed, softer ones are deeply cut into, thus changing the minor orographic features of a region. Dependent, in part, upon the physical constitution of the rocks affected, is the action produced by the freezing of water saturating them. In case the conditions be favorable, we may find a more or less completely developed system of foliation. Minute fragments are separated from the main rock, and frequently, by a process of regelation within fissures thus formed, large slabs are removed. Certain rocks, less homogeneous than others, absorb a great deal of water, which forces off innumerable particles upon freezing. In this connection may be mentioned the phenomenon of "exfoliation". According to the interpretation usually given to this term, it signifies a scaling-off of some rocks, dependent upon reaching certain temperatures through the action of the sun's rays. Physically this is certainly possible, but I am of the opinion that in reality it does not often occur. Although during the warmer season of the year, rocks exposed to the sun's rays frequently acquire a comparatively high temperature, it seems improbable that this could produce the result of extensive fissures. If we take into consideration the coefficient of expansion of the various minerals composing such rocks, and furthermore consider their points of fusion, the suggestion seems still less tenable.

Wind erosion, in some highly favored localities, is productive of very striking results. Usually, however, its action is confined to the shaping of minor details. Wherever the wind can have full sweep and the sand may find objects upon which to expend its work, there we will soon recognize the peculiar workmanship of this agent. Attacking most rapidly those portions which offer least resistance, the sand will carve out forms which will indicate the physical structure of the eroded material. Exposed surfaces will be modified in such a way as to denote the prevalent direction of the wind, and so as to furnish an idea of the relative amount of sand utilized in the "blast".

It would carry us altogether too far were any attempt here made of giving even only the general results of the various kinds of erosion upon different rocks. In the subjoined pages we will have to deal with mainly one class, that produced by mechanical deposition. We shall see that even slight variations in the constitution of this material may be productive of far-varying results. We have for our consideration a series of forms, referable to several groups, each one of which may be considered as an expression of definite, pre-existing conditions. It shall therefore be the object of this paper to present them in such a manner as to comprehend their present and eventual form, the materials composing them, and the mode of their formation.

In order to discuss the material at hand in a somewhat systematic manner, it may appropriately be classified. Among the most prominent forms in Colorado are those that for many years have been known by the appellation of "Monuments". Related to them are statuesque and mural products of erosion. Caves and arches, so far as belonging in this category, follow, and isolated forms, varying in their character, occurrence, and method of genesis, complete the list.

Applying such subdivisions as are warranted by the occurrences observed, we arrive at—

- MONUMENTS.
  - *Normal.*
  - *Accidental.*
- STATUESQUE FORMS.
- MURAL FORMS.
  - *Normal.*
  - *Intruded.*
- ARCHITECTURAL FORMS.
- CAVES.
- ARCHES.
- ISOLATED FORMS.

NORMAL MONUMENTS.

MONUMENT PARK.

During the great "Pike's Peak" excitement in 1857, this famous spot was discovered. To the adventurous pioneers, forsaking all comfort and risking their lives in the search after the promised gold, this region appeared as one of surpassing beauty. After the wearisome and dangerous march across the plains, those early travellers at last found themselves at the immediate base of a high range of mountains. Foot-hills forming the transition from rocky, barren slopes to the plains, contained many little valleys, rich in verdure and pleasant scenery. It is scarcely to be wondered at, then, that the men who for months had rarely seen anything but sage-brush and cactus should express their extravagant admiration in such terms as the "Garden of the Gods". Not only was a place of rest here offered them, but they met with forms to them utterly unknown. Beyond the outside sharp ridges, the classical "hog-backs", lay narrow, fertile valleys. Rising behind were densely timbered, partly precipitous hills, and in the distance the snow-capped or bleak summit of Pike's Peak towered far above them.

In these little valleys were first found the typical "monuments". Fashioned after one general pattern, though ever varying in their detail-features, they produce an indelible impression upon any one who has ever seen them. Brilliant in coloring, contrasting sharply with the vegetation, and admirably set off by the background of hills and mountains, they present a view that pen or pencil is not able to describe. It required but a very short time for rumors of these almost fabulous forms to spread far and wide, and many tourists travelled to these famous regions. Within a brief period, the distinguishing feature of Colorado was, to strangers, its marvellous "monuments", and hearsay studded the entire territory with such products of erosion. For a long time, indeed, their horizontal distribution was essentially a mythical one, and it is to Colorado's geological explorers mainly that we owe the first definite knowledge with regard thereto. To-day, all the localities are known, many of the most prominent monuments have received names dictated by the impulse of imagination, and of more than one thus favored spot have minute detail-maps been prepared. In presenting the facts connected with the case, we regret that all myth and much of the poesy must rudely be dispelled, as the geologist, in his discussions, deals directly with the questions involving "cause and effect".

Monument Park is located a few miles south of north latitude 39°, on the eastern border of the Front Range. In 1869, Dr. Hayden visited the region, and referred the sandstones composing the monuments to the Tertiary period.* He mentions their characteristics and the surprising evidences of erosion shown by them. All along Monument Creek, on its western bank, these singular forms can be observed. At times they appear ornamenting a steep rock wall, and again they stand isolated among treees or in the grass. Following down Monument Creek, we reach the Park. Passing through the Park, in a southerly direction, we are led into the Garden of the Gods. As these two localities are but a very short distance apart and show the same typical developments produced by erosion, they shall here be discussed together. Usually the monuments are found clustered in small groups, each of which presents a perfect picture in itself. Varying in size, in shades of color, and in their surroundings, every group, though essentially a repetition of every other one, offers new features to the observer. The weird form, unusual to the eye, and the strange contrasting of colors, possess attractions that cannot be resisted. Dr. Hayden very truly says:—"The whole region would be a paradise for an artist."

The form of these monuments is a characteristic one, and is found to present but one main type throughout that entire section of country. A more or less cylindrical or conical column rises vertically from its surroundings, and sustains upon its top a tablet of greater diameter than the upper portions of the supporting rock. Perhaps the most appropriate comparison as to shape would be with a bottle. Usually narrow at the immediate base, the shaft widens out a little higher up until, analogous to the neck of the bottle, it grows narrow again. Upon this neck rests the large mass of rock, apparently most delicately poised. The shape of the "head" varies considerably. In one instance it may be a perfectly flat tablet, resting squarely on the column, as if placed there artificially, and again the neck may gradually widen, so as to mediate a transition between the two portions. This latter is the more frequent occurrence. A more or less corrugated surface combines with the colors exhibited to produce the effect of prominent relief. Although retaining the general outline of form, the monuments vary in height. They are found from 4 feet to 30 feet high, grouped together often as an affectionate family might be supposed to place itself. Within certain areas an arrangement of the monuments in rows is sometimes noticeable. This is due to the influences of primary erosion.

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* Rep. U. S. Geol Surv., reprint, 1867 to 1869, p. 140.

Structurally the monuments present very definite features. They are composed of sandstone, varying in texture. Portions of it are exceedingly fine-grained, while others show the character of conglomerates. *A priori* it must be accepted that the protecting cap is formed of harder material than the column. Dr. Peale furnishes* a description from Monument Park. According to his and Mr. Taggart's examinations, "the lower third of the exposed rock is fine-grained, containing argillaceous layers". Above that the sandstones become coarser, "almost conglomeratic". The capping of these monuments is formed by a hard conglomerate, firmly cemented by clay-iron-stone. While the shaft exhibits mainly lighter shades, the "cap" is of a dark-red or rusty brown color. White, grayish, yellow, and pink tints are exhibited by the column, often blending into each other very well. Surmounting this is the prominent, dark cap-stone. So thoroughly has this resisted erosion that not unfrequently the caps of several columns are formed by the same piece of conglomerate. All the bright colors exhibited, among which green may sometimes be found, are due to the presence of ferric oxygen-compounds. The entire monument represents an unbroken series of mechanically deposited sediment. From the base to the cap-stone, the rock belongs to one definite period, and must be regarded as a unit. It is with especial reference to this point that I have distinguished between *normal* and *accidental* monuments. Each rock that to day stands isolated speaks to us of the history of its locality. It is the mute yet convincing witness to conditions existing long before the history of man. It tells us of the great changes that time and nature's agents have wrought in a region that now bears no resemblance to what it formerly was. Where broad valleys with streams and fertile meadows may at present be found, sandstones and conglomerates originally covered the entire region. Where deep ravines and narrow cañons contain swiftly flowing streams, there nothing existed formerly but an even, gentle slope eastward. Viewing thus the testimony furnished by the existence of these monuments, we cannot but marvel at the enormous amount of work done by the never-ceasing action of nature's agents. Masses have been removed and transported for many miles, that would form mountains could they be collected together. Decomposition, erosion, and removal of the material have so thoroughly altered the character of that section of country, that, were it not for the monuments, we should be at a loss how to reconstruct it. As it is, we have at hand applicable data to guide our inference, and founding our arguments upon observation, they stand or fall with the accuracy of the latter. Transportation of material has taken place at other localities on even a grander scale than here, but we have, in the presence of the monuments, a suggestion that forcibly appeals to the human understanding. Not often do we find a spot where the great activity and the results of erosion are so directly and intelligibly placed before us as here.

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* Rep. U. S. Geol. Surv., 1873, p. 200.

Regarding the formation of these monuments, we are enabled to gather sufficient data thereupon by observations made on the spot. By primary erosion, due mainly to flowing water, the horizontal distribution of the monument-groups was determined. Channels were cut into the readily yielding material, and thus more or less isolated ridges or groups of the sandstones remained. In part by flowing water, in part by meteoric agents, the soft rock was gradually eroded. Such portions as were most loosely cemented were first attacked, resulting in the formation of excavations of greater or smaller extent. The hard resisting stratum above alluded to as being a red conglomerate acted as a barrier to the encroachments of erosion. Protecting, in a great measure, the underlying soft material, it gave way only when its supports eventually broke down. The constitution of these underlying sandstones is such that they will readily absorb a large quantity of water. By the expansion accompanying the freezing of this water, considerable quantities will be "scaled off". If this process continues for a sufficiently great length of time, the weight of the conglomerate will crush its supporting portions, and isolated remnants will mark the direction of a previous continuity. Rain, snow, and other atmospheric precipitations will add their share in detaching and removing particles and fragments of the rocks. From such influence the cap-stone will partly protect the column or series of columns supporting it. Erosion by sand can become very aggressive in such instances, provided the wind has ample sway. The sharp particles rapidly eat away the more yielding portions, reducing gradually the diameter of the shaft in certain directions. Its repeated action produces a corrugated surface, indicating the locations of the most readily yielding masses. It is due to this influence, probably, that the "neck" of the monument is generally very much narrower than the base. The sand striking against the cap rebounds, and a larger quantity than perhaps otherwise would be the case finds an opportunity to expend its force upon that portion. Totally dependent upon the physical constitution of the eroded rocks are the detail-features they exhibit. In case they are composed of very homogeneous material, the result will be a highly symmetrical product. Inclusions of either harder or softer masses, or a varying density of the rock, will necessarily be made manifest upon erosion. Thus we are enabled to judge, even from the exterior form, as to the general composition of the monument.

In the course of time, the sustaining column is worn so thin that it can no longer carry the weight of the cap. This falls off, and before long the once stately monument is reduced to a mound of gravel and

For a time, the cap may remain comparatively intact, after it no longer occupies its prominent position. Numerous fragments or bowlders of the characteristic red conglomerate give testimony of the former existence of monuments.

Reference to the Report of the United States Geological and Geographical Survey for 1873, Figures 4 and 5, and Plate III, opposite pages 32 and 36, will furnish some idea as to the forms of such products. The monuments therein represented occur in Monument Park, and the collection may be regarded as presenting typical forms of these curious products. Any description of them must necessarily fall short, and may easily fail entirely to convey an adequate impression. To one who has never seen either these or similar occurrences, it must be a difficult matter to appreciate the great variety of form and coloring.

DOUGLAS'S CREEK.

Similar in shape, though of different structure as compared with those near the Front Range, are some monuments on Douglas's Creek. This stream is one of the largest southerly tributaries of White River, entering it about 15 miles east of the western boundary of Colorado, near north latitude 40° 05′. For a long distance, Douglas's Creek, so named after the head-chief of the White River Utes, passes through sandstones and shales belonging to the Wasatch Group of the Tertiary. Steep bluffs enclose the valley of the stream, showing along their edges unmistakable evidence of aqueous erosion. Although the entire region is a very dry one during certain seasons, large quantities of water flow there at times. It was on the top of a small bluff that a number of "monuments" were noticed in this region.* A cylindrical or somewhat angular column of argillaceous, partly arenaceous shales, sustains a huge slab of sandstone. Standing, as they do, near the upper, steep edge of a bluff, these rocks resemble more nearly mushrooms than anything else in their general outlines. They are from 8 to 12 feet high. Gray, yellow, and brownish shales make up the column, showing very clearly the planes of original stratification. Slight changes of color or of shades produce a banded appearance. Upon this base rests a protecting cap of fine-grained yellow sandstone.

Considerable interest attaches itself to the formation of this group. Originally the joints of the sandstone probably afforded the first cause for their present existence. Water entering and gradually widening these fissures, during its flow from the top of the bluff towards its steep edge, eventually succeeded in isolating certain portions of the rock-mass. Having been aided by the existing joint-fissures, this isolation was a matter of little difficulty. Atmospheric agents rapidly attacked the shales supporting fragments of sandstone, and reduced the diameter of the columns. Frost, probably, here proved to be the most destructive factor. The large number of small jointing-planes traversing the shales greatly facilitated the process of reduction. In addition to aiding the erosion by frost, these fissures allowed considerable quantities of the shale to drop off on account of the pressure produced by the cap-stone. Dependent upon the direction and extent of the fractures is the transverse section of the column. If they are continuous, and mainly trend in one direction, it will be elliptic. If not continuous, and running in several directions, the shaft will more probably have a round cross-section. Frost and pressure, then, may be regarded as the chief agents in determining, in this instance, the form of the column. Sand will have but little direct effect upon shales, as they do not offer resistance sufficiently great to produce direct fracture.

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* Compare illustrations in Report of the United States Geological and Geographical Survey for 1876.

In the course of time, the supporting column of shale becomes so thin that it can no longer sustain the weight of the cap. It is crushed, and soon nothing remains to mark the former monument but a small mound of arenaceous clay. The duration of products of erosion like these on Douglas's Creek must necessarily be shorter than that shown by the analogous forms of Monument Park. Not unfrequently very small ones may be found, but I have nowhere seen any comparable in size to those just described. In a region so monotonous as regards scenery as the one south of White River, even a slight variation from the typical bluff and rocky wall produces a pleasing impression. Though the rocks there afford ample opportunity for the formation of such groups, their perishable nature probably accounts for the rarity of the occurrence.

ACCIDENTAL MONUMENTS.

As accidental monuments I designate such having a different genesis from those described above. Whereas the former represent a certain unbroken portion of one specific geognostic group, these latter are composed of members of two groups mainly. Thus the conglomerate, capping the monuments of the Garden of the Gods, is the next youngest product of deposition to the neck of the column. In accidental monuments, however, no such relation exists. I have considered it advisable to make this distinction, as the very classification conveys a certain amount of information. We have, in Colorado, numerous representatives of both types, and have had occasion to study both of them thoroughly. As will be seen, the monuments of this class may lay claim to greater grandeur than the preceding ones. Less accessible, as to location, than the latter, they will probably remain unvisited for many years, until the energetic tourist may finally conquer all obstacles and disturb their present seclusion.

SOUTH RIVER.

South River heads on the continental divide about west longitude 107° and north latitude 37° 34′, and flows in a northerly direction. After a course about 10 miles in length, it enters the Rio Grande del Norte, a few miles below Antelope Park. Rising near South River Mountain, 13,160 feet high, this stream swiftly flows through its narrow valley. Heavily timbered on either side, the immediate surroundings of the creek show green meadow-land and groves of quaking-asp. Pine-forests rise upon the steep slopes and continue unbroken to the summits of dividing ridges.

Riding up this stream, from the Rio Grande, it was that we discovered in 1875 a series of erosion-products that for unique character and beauty is possibly nowhere equalled. Gradually ascending on a dim Indian trail, we found the continuity of the timber farther up-stream broken. Rocky, precipitous cliffs appeared high above the trees, entirely closing, as it seemed, the valley. Progressing farther on our march, the indistinct masses slowly resolved themselves into group upon group that can be "seen but not described". From the steep slope to the eastward of South River, massive walls of dark brown rock jutted out, transversely trending across into the valley. As we still further approached them, we found that every one of these walls was profusely ornamented by "monuments". Deep ravines existed between them, filled, in the most chaotic manner, by trees, monuments, and enormous masses of *débris*. It required but a moment to recognize the beauty of these groups. For a long distance they stretched along the slope, the largest one of them being about half a mile in length. In the background, toward the divide eastward, were visible steep, inaccessible, mural faces, from which the walls above mentioned originated. Varying in height from 100 to 600 feet, these cliffs produced a very great impression. Few trees only were found on the tops of the walls, and the bare rock was most effectually exposed to the erosive action of nature's agents. No one could but admire the results produced. Thousands of monuments, of every size and shape, ranging in height from 2 feet to 400 feet, densely studded the summits and lower edges of the walls. Groups of a hundred or more occupied some prominent spot, and large pines appeared as pigmies by the side of the towering forms. Caves have been cut deeply into the yielding rocks, and through arches of ample dimensions glimpses of more distant groups may be obtained. Climbing up on one of the projecting walls within the largest groups, the sight was surpassingly beautiful. Standing thus isolated, far above all immediate surroundings, the observer might count hundreds of slender monuments at his feet, looking down upon the almost bewildering scene. Pine timber, appearing like a freshly started growth in size, covered intervening portions between clusters of gigantic dimensions. Grouped together so as to be united at the base, the graceful spires rose high up from the ground, and separating into columns, each one supplied with its accessories, the total effect was one strikingly resembling that of the ornate style of Gothic architecture. Looking down toward the base of the wall, a perfect sea of conical and cylindrical shafts were seen, most of them protected by the characteristic cap-stone. Farther off, in the distance, monuments projected above the surrounding timber, until the last ones were lost as a mere line against the bright horizon. Bowlders, huge and angular, broken off from the walls or precipitous cliffs, have rolled down among the timber and marked their courses by devastation. Piled up sometimes at the base of a monument-group, they impart a wild effect to the strange picture. Fissures, cracks, and narrow ravines, channels for rushing water during the heavy rains of the "wet season", are cut into the cliffs. Bordered by the monuments and containing the *débris* incident upon their formation, they look dark and weird. Caves extending into the readily yielding rocks appear as inviting abodes for the bears for which that region is noted.

Though much might be written about this curious spot, the pen can convey no adequate idea of its impressive beauty. It seems as though nature had here furnished, with a lavish hand, designs to be imitated by man, designs that for the singularity of their form and depth of expression must necessarily inspire the seeker after severe beauty and harmony. As the growing vegetation has been employed in furnishing us with one of the noblest styles of architecture, so could these forms be utilized to produce impressions appropriate to the purposes for which they might be adopted.

It will, perhaps, best serve the purposes of this paper to describe a few of the groups observed, and to permit each reader therefrom to construct for himself a picture of what was seen. An illustration given in the Annual Report for 1875, Plate XIX, page 156, may serve more readily to interpret what will be said regarding the forms it exhibits.

Near the top of one of the walls mentioned above, I found a small group, thoroughly characteristic. The highest one of the monuments measures about 35 feet. Essentially all of them are "bottle-shaped". A heavy mass near the base, more or less angular, diminishes in diameter either gradually or rapidly, thus forming the slender "neck". This supports a protecting cap of proportionate size. Small, lateral monuments are constantly being formed or being destroyed. A singular instance was observed in the group under discussion: one monument placed on top of the other. The poise is so true that both may go on diminishing in size for many years to come and may yet retain their relative positions. Deeply furrowed sides very aptly illustrate the word "weather-beaten". Similar in structure and general appearance are the large monuments located between some of the projecting walls. From a base of 60 to 100 feet in diameter, more frequently oval than round, they rise to a height of 400 feet.* Often small columns, with or without cap-stones, ornament their sides for a long distance upward. One striking dissimilarity between the forms of this region and those of Monument Park exists in their varying height. While at the latter place definitely located strata determine the relative height of the columns, we have here an absolutely irregular distribution of the capping-stones, resulting in the great variations of relative size. In this feature, perhaps, lies the charm of attraction that the groups of South River possess, besides that imparted to them by their wild surroundings.

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* Measurements of heights were made by means of aneroid and hand-level.

Mr. Rhoda has described the monuments from this region in the Annual Report of 1875. He aptly expresses the feeling impressed upon the observer of those enormous masses in the following words:—"These are sentinels in more senses than one—sentinels guarding from profane eyes the holy secrets of nature—for the stones which they bear upon their shoulders, far over the traveler's head, carry a menace not to remain unheeded." The seclusion of the spot and its location away from the general route of travel or mining exploration have permitted this wonderful occurrence on South River to remain hidden thus far from the sight of the white man. Indians, in former days, attracted probably more by the presence of game and grass than by the beauty here exhibited, made frequent visits to the valley, as their trails and old remains of camps testify. To them the animate portion of this world appeals more directly than the mute witnesses of nature's skillful power.

Structurally the monuments of South River differ widely from those heretofore described. In giving the definition of such as may be classified "accidental", mention has indirectly been made thereof. The material out of which the forms of this locality were carved is a heavy deposit of trachytic conglomerate. Its thickness may be regarded, at this locality, as exceeding 600 feet. Almost every variety of conglomerate is here represented. Taking it as a whole, it is composed of bowlders of varying size, cemented by a mixture of sand and clay. Wherever, during the process of deposition, these latter constituents have become predominating, the rock assumes the character of a typical sandstone. At such places, too, stratification may sometimes be observed. The main mass of the conglomerate, however, shows no stratification, and regular deposition of the bowlders is a very subordinate feature. Trachytic material makes up the entire mass, clay, sand, and bowlders. It is evident that ultimately the height or size of the monument must be determined by the dimensions and weight of the cap-stone. We find single blocks sometimes weighing several tons. A secondary product, acting as cement, may be noticed in the form of quartz, intimately associated with argillitic matter. Were this to occur throughout large masses of the conglomerate, then it would far more persistently repel the action of erosive agents; but its appearance is very limited. In color, the monuments and walls are brown, showing numerous shadings into red, yellow, gray, and white. In part, such changes are due to the physical constitution of the conglomerate. Wherever it more nearly resembles sandstone, the shades become lighter. An admixture of magnetite, which is contained in the trachytes, upon decomposition produces bright red or brownish-red colors. Owing to the character of the mass containing it, however, this mineral cannot be decomposed, excepting at such places where the rock is comparatively protected from erosion. At other points, the removal of material progresses so rapidly that not sufficient time is afforded for the completion of the chemical change. Such material as was most readily transportable during the period of formation of the conglomerate is, by reason of its lighter specific gravity, comparatively free from the coloring ingredient. In one feature, perhaps, may this conglomerate be regarded as exceptional if compared with others. This consists in the irregular accumulations of physically differing masses. Irregularly shaped masses of fine-grained, loosely cemented material may be regarded as inclusions within the normal conglomerate. Their existence is taken advantage of by erosive forces, and they rapidly yield to the oft-repeated attacks.

Within the various groups exhibited on South River, the process of their formation could be most admirably studied. Erosion by flowing water, assisted probably by the movements of temporary glaciers, have first shaped the general outlines of the valley. Thus was the conglomeritic deposit cut apart after a portion of the hard trachyte protecting it had been removed. Subsequent flows, more particuarly from the high ground east of the valley, cut parallel gorges and ravines into the readily yielding conglomerate. These had a trend at approximately right angles to the course of South River. The ridges, formerly dividing them, now remain, in consequence of still further denudation, as the transverse walls above mentioned. Their relative position to the main cliffs eastward supports this view. While most likely fluviatile erosion determined the first great separations of the mass into groups, other agents were employed to carve out the individual forms. From observations made on the ground, it would appear that the walls were slowly growing thinner, owing to the gradual separation of columns from their sides. Among the most potent agents preparing absolute removal of material, we must count the influence of frost. During probably eight months of the year the temperature falls below the freezing-point at night, while during more than one-third of the time the heat of the day will produce a complete remelting of the frozen water. Wherever, then, we have loosely cemented material, readily saturated by water, we will find that the repeated expansion upon freezing eventually places the component particles of rock in such positions as to be easily removed. It was observed that innumerable bowlders of varying sizes projected from the steep walls. Precipitated moisture, finding its way down along the steep surface, will encounter one of these obstacles, and, concentrating its volume along one line, will follow down along either one side or the other of the erratic block. Thus gradually a groove will be eroded downward from either side of the bowlder. If we continue this process for a long period of time, it must finally result in an isolation of a columnar mass, with the bowlder as a protecting cap. Examinations showed that this method of formation would satisfactorily explain not only the form, but more particularly the distribution, of the monuments. They occur most densely clustered along the base of the walls and along their edges. Again they closely stud the sides of newly worn ravines and gullies. This species of formation is greatly facilitated by the action of pluvial erosion. Rain beating against walls, which have at certain places been prepared for its transporting force, can readily carry away such portions that the isolation of columns will be accomplished. After the column is once formed, erosion by sand driven before the wind will have a very appreciable effect upon the detail ornamentation and sculpturing of its exterior. From the illustration above referred to may be recognized more clearly what has here been said. Scarcely any one monument can be found which does not show either completed accessories, or such in the course of formation. In intimate relation to the distribution of bowlders within the faces of the walls, is the grouping of future monuments. How slowly or how rapidly they may be formed, however, cannot even be surmised.

In the course of time, the supporting column can no longer sustain the weight of the capping stone and this drops off. This result is hastened by the decrease of the diameter of that portion which has been designated as the "neck". Upon the removal of the cap, therefore, the former monument presents the appearance of a tall, slender, more or less conical shaft. These forms I have termed "needles" in previous reports. When the destruction of the monument has progressed so far, its end is hastened. Rapidly the conglomeritic mass loses in height, becomes more obtuse, and unless new obstacles present themselves to arrest the progress of the truncation, the only remnant of the former monument will be a small mound of irregular-shaped bowlders and sand. On the other hand, if the original form was a high one or broad, it is very probable that from the ruins of former beauty will rise new forms, smaller in dimensions, but similar in construction. Throughout the entire locality, observations were made with a view to determine as accurately as possible the method of formation of these interesting products of erosion. They have led to the results above enumerated, and, although much more might be said with regard thereto, but little could be added tending to throw further applicable light upon the subject.

After ages have passed, the features for which this region may now justly be called unique will have disappeared. The sure hand of erosion will gradually cut down what even to-day are but the remnants of a former extensive deposit. It is possible that the removal of soil and the trachytes overlying the conglomerate may expose fresh surfaces to attacks by erosion, and that thus the forms may be perpetuated. I am acquainted with no locality which presents monuments that can appropriately be compared to those of South River. Perhaps the nearest approximation in form thereto may be found in the Tyrol, near Bozen. They are composed of different material, however, but their genesis is essentially the same.* At no place in Colorado certainly do we find so complete a series of such forms, and one so advantageously situated as to surroundings.

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* Compare Lyell, Principles of Geology, vol. i, p. 336.

UNCOMPAHGRE REGION.

On one of the small branches of Henssen's Creek, a tributary of the Lake Fork, we were camped for several days during 1874. Our location there was about west longitude 107° 30′, north latitude 38°. Heading at a rhyolitic peak, southwest of the great Uncompahgre Peak, a swift little mountain stream flowed through its narrow valley in an easterly direction. Above the camp, massive basaltic rocks protruded through the broken rhyolites, forming steep, almost inaccessible walls. Farther down stream, the valley widened a little, bordered on its south side by timbered hills, on the north by a long-extended, grassy slope. Several thousand feet above this slope, black basalt presented vertical walls, the crumbling masses of which rolled down into the valley below.

Cut in the form of a horseshoe into the grassy slope was an extensive excavation, filled with "monuments". In height they ranged from 2 to 30 feet, forming a most striking contrast with their surroundings. Rising from a massive base, the conical columns supported heavy blocks of black basalt. Grooved and corrugated surface, pyramidal lateral points, and the almost white color of the monuments denoted them as belonging to a curious type. Little rills and grooves covered the entire exterior portion of the shaft, terminating often in small cave-like excavations. Densely clustered together, the total isolation of this occurrence appeared as thoroughly characteristic. Black or red bowlders of basalt strewn throughout the monuments relieved the color, and the bright green of the hillside formed an admirable frame for the picture.

An illustration given in the Annual Report for 1874 (fig. 1, page 195) represents two of the monuments near the entrance of the horseshoe. Imagining the entire space, about 150 yards long and 100 yards wide, filled with forms of this kind, varying in height and essentially white and black in color, we can construct for ourselves a picture of the scene. Deep, narrow gullies are worn down through the edges of the horseshoe, and dry runs separate the several most prominent monument groups.

A trachytic tuff, that has been designated as Trachyte No. 1, composes the columns. Local accumulations of this material occur throughout the region, and generally give rise to the formation of more or less picturesque products of erosion. Physically, this tuff is a loosely cemented agglomeration of feldspathic and quartzitic constituents mainly, yielding readily to fluviatile and pluvial erosion. Admixtures of caolinite render it less liable to successful attacks by sand-blasts, but afford an opportunity for the greatest possible effect that can be produced by frost. The grooving and fluting, caused either by beating rain or by slowly moving water, shows conclusively, by its arrangement, the thorough preparation which the material has undergone. Blocks of black, sometimes red, basalt form the protecting caps imposed upon the white or light yellow, rarely pink, columns. Their origin must be looked for at the steep faces of the plateau edge, high above their present level.

Torrents caused by violent rain-storms, and by sudden melting of the accumulated masses of snow higher up, have given the first impulse to the formation of this interesting group. Sweeping down the hill-side, over the impregnable masses of trachyte, they have reached this easily eroded deposit of "ash". Rapidly cutting down into the soft material, no resistance has been offered to the eroding action, save by the erratic blocks of basalt scattered along the slope. There the water must separate, thus carving, primarily, sharp, narrow ridges out of the tuffs. Subsequent erosion caused transverse separation of portions of these ridges, and the bowlders that first determined their preservation remained as protectors upon the tops of more or less pyramidal forms. Rain, hail, snow, frost, and wind were the artists that eventually moulded the monuments into their present shape. Ever changing in their detail-features, losing material day after day, they gradually approach that time when the cap can no longer be sustained. Without the protection of this accidentally placed rock, the column rapidly goes toward its final destruction. The constant denudation, the never-ceasing exposure of fresh surface, has precluded the possibility of any vegetation thriving within the area assigned to these monuments. Though utterly devoid of this feature, which constitutes so large a portion of the charm at South River, the exquisite workmanship of the detail-carving and the pure colors exhibited, readily allow one to forget its absence. About two hundred of these monuments are here grouped together, varying in size and in arrangement. Small ones occupy isolated positions, caused not unfrequently by the protection of the basalt after it had abandoned the first column by which it was supported. The largest ones are near the walls of the horseshoe, frequently having one common base, and separating from each other at different points of height.

PLATEAU CREEK.

Dr. Peale, in 1874, found some very prominent occurrences belonging to this class.* Plateau Creek flows into the Grand River north of the Great Mesa. About west longitude 108° and north latitude 39° 20′, the monuments in question were observed. Tertiary shales compse the bluffs bordering upon the creek. A number of the ridges composed thereof are covered by basalt, which had its origin to the northeast. Erosion has isolated a number of these bluffs, and their edges, fronting the creek, are formed by high, massive monuments. Weathering and fluviatile action has separated portions of the superincumbent basalt, and the fragments form the cap-stones upon the columns. Shales, of light yellow and gray colors, nearly horizontally stratified, are cut into more or less regular cones, and support blocks of black basalt. Dr. Peale says:—"The covering of basalt which once covered it has been partially removed. The remnants left reach from 200 to 250 feet above the general level, forming monument-like points that are visible from a great distance." Slower, probably, in their process of formation, a long time, too, will be required ere these groups yield to final destruction. Massive and solid as they are, they can for ages withstand the attacks of erosive forces.

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* Rep. U. S. Geol. Surv. for 1874, p. 91.

STATUESQUE FORMS.

As such we may designate products of erosion not modelled after one definite type. They are more or less irregular in form, unsymmetrical, and represent not unfrequently figures that a lively imagination can readily compare with well-known subjects of the plastic art, or with animate beings. Popular discrimination has endowed them with names referring to the originals of which they remind the observer. Not only have animate objects and artificial representations thereof been utilized for the comparisons, but even the ruler of the infernal abode has received tribute in the polite appellations some rocks have received. Were it possible to collect and enumerate all those forms of erosion that within Colorado may lay claim to resemble subjects above named, we should be able to produce a very formidable array. As it is, however, I desire to confine myself to such occurrences which may be regarded as characteristic for the geognostic formations containing them. Definite conditions, both constitutional and active, are requisite for the production of results referable to this category. Isolated instances are almost innumerable, but cannot enter into consideration here, as their discussion would lead us far beyond our limits.

WHITE RIVER REGION.

No locality in Colorado, perhaps, is more favored with exhibitions of statuesque forms than the White River region. West of the one hundred and ninth meridian, the light gray and yellow shales of the Tertiary Green River Group are overlaid by massive beds of yellow and brown sandstones. For several reasons, these furnish an almost unequalled material for the production of statuesque forms. While examining that section of country during 1876, every turn led us to new and most grotesque figures. From the river-valley steep walls rise to an elevation of about 1,200 feet. On the summits of the ridges leading down to the stream and on small hills, remaining as evidence of active erosion, we find the groups in question. Appearing at times in the form of walls, simulating ruins of castles of enormous dimensions, the smaller groups may often be compared to statuary or to animate creatures. A certain amount of latitude must necessarily be allowed for the comparison, but not unfrequently the forms are so striking as to suggest, at once, a similarity. Located upon prominent points, such as the summit of a ridge or the top of a small hill, the eroded rocks stand out boldly, changing in outline and relief as the observer changes his position. Thus one rock, about 18 feet high, from a distance appeared as representing the bust and head of a most venerable-looking, bald-headed man. Changing slightly our course, the spectacles of the old man turned into the shield of a cap, his bald head grew elongated and was onamented by a round button on top; his nose grew longer; the chin retreated and with it the prominent breast, while a corresponding curvature of the upper portions of the spine took place. We had, instead of an eminent-looking man, a typical representation of the race-course. Not long, however, did this figure last, for a short turn, shortly after, revealed to us the characteristic features and head of a negro baby. Numerous such instances could be described from that locality, instances where the most absurd caricatures were seen on a gigantic scale.

I have selected for illustration in the Annual Report for 1876 a small group within the cañon of White River at the junction of a small stream therewith. Three isolated columns, approximately round upon cross-section, occupy the summit of a small, smooth hill. The highest one is about 80 feet high. A little behind it stands one less regular in outline, and to one side is the smallest, very thin shaft. Struck by the appropriate and almost affectionate disposition of the group, we at once designated the figures as the "Happy Family". Quietly and in harmony they have thus stood side by side for centuries, probably, and they well merit recognition at the hands of explorers.

The first essential structural condition of rocks exhibiting such features is the lack of homogeneousness. Differences of texture must occur, not along the planes of bedding, but irregularly distributed throughout the mass. In order that this may be accomplished, it is necessary that the rock should not be separated into thin strata or layers, but should form thick, heavy masses. In that case, the percolation of mineralized waters and the action of other agents producing chemical changes can result in a thorough disturbance of a uniform constitution. Within the White River region we find that the Upper Green River sandstones contain irregular admixtures of cementing material, thus rendering them, firstly, of unequal hardness, and, secondly, producing unequal resistance to eroding agents. This condition is a necessary one for the occurrence of forms such as have been described. Were it not for this textural inequality, the processes of abrasion and decomposition must simply take place in accordance with the climatal conditions of the country and the composition of the sandstones, without producing the results observed. In this instance, however, portions that are constantly exposed to atmospheric influences, more so than others, have been able to withstand them by virtue of these physical variations.

Fluviatile erosion gave the first direction as to the distribution of monumental and other forms. Evidence there obtained tends to show that extensive transverse fractures—joints—more or less open must have traversed the sandstones. These were undoubtedly taken advantage of by the flowing waters. While on the one hand they facilitated the extension of textural irregularities within the masses, they, on the other hand, greatly aided the rapid accomplishment of disintegration and transportation. After valleys, mostly narrow, had been cut into the yielding rock, the space afforded to the water was sufficiently great to remove it from the summits of hills and ridges. Thus the remnants we now find there were preserved, surrounded by a talus formed from their own detritus. Pluvial erosion and chemical changes within the rock itself wrought many changes, lessening and modifying the remaining rock-masses. Frost prepared the softer portions for removal, and sand-blasts carved, most skilfully, the intricate forms we often observe. Sandstones can be found in that region, as in others also, that show very remarkable reticulation upon their surfaces. It is not so evident, at first sight, whereby and why this curious effect of erosion is produced. This species of reticulation manifests itself in a manner as if the material composing the net were laid upon the surface of the rock. The meshes are excavated proportionately to the size of the reticles, and often show a remarkably regular arrangement. Such occurrences can be observed both parallel with the stratification of the sandstones and at varying angles to it. Primarily, this result may be derived from the existence of argillitic inclusions within the sandstone. They are less able to resist eroding influences, and by gradually disappearing from the exposed surface may produce the effect of reticulation if somewhat regularly distributed. This, however, appears to be the less frequent mode of formation. It may be assumed that minute joints, now closed, traversed in various directions the sandstones. Infiltration of water containing certain minerals, either in solution or in suspension, will tend to render those portions immediately adjoining the joints harder, more compact. Complete evidence is extant, proving that very many of the sandstones are laminated as to texture, while structurally they may appear perfectly homogeneous. Such lamination is one that can readily be detected by testing the hardness at right angles to the stratification. We have, then, the result: a block of sandstone traversed in various directions by alternately soft and hard zones. Upon exposure, frost will rapidly take advantage of this feature, and other erosive agents will soon remove the more easily yielding portions, leaving the harder ones in the form of reticulated *bas-reliefs*. Within certain formations, more particularly the Upper Cretaceous and Lower Tertiary sandstones of Southern Colorado, this occurrence may be regarded as characteristic. Erosion by sand-blast is probably one of the most effective in producing the result described.

Dependent upon the amount of erosive influence to which the statuesque rocks are exposed will be the maintenance of their forms. It is scarcely possible to give any general rule for the shape and continuity of the harder, permeating portions, unless they reach the extreme form of concretionary inclusions. Although these are by no means wanting in the sandstones of the White River region, the results we have above mentioned are due to irregular changes of texture within the sandstones.

They might be characterized, perhaps, as unequal impregnation by the cementing material. Within the group we have been discussing they form a distinguishing feature, although not found occurring absolutely uniformly throughout its entire horizontal and vertical extent.

POLE CREEK.

Pole Creek flows southward into the Rio Grande, which it joins at about west longitude 107° 30′ and north latitude 37° 45′. Its course, just before the junction, lies through a narrow, grassy valley. Within this may be found small local accumulations of trachytic tuffs. On the east side of the creek, about 4 miles from the river, a very curious group of eroded rocks occurs. They are composed of light tuffs, more or less firmly cemented. Located immediately upon the bank of the stream, they rise abruptly from 12 to 30 feet above the surrounding soil. No connection, above the surface, is maintained with any other outcrops of the same material. Owing to a change in the character of the feldspathic cement, the eroded rocks have assumed most fantastic shapes. A ready imagination can soon recognize in them a venerable exhorter, located within a pulpit, and an appreciative audience of eight or ten persons, either seated or standing in front of him. Were it not for the incongruity, the attempted portrayal of dress might lead the observer to picture to himself a diminutive congregation of devout Knickerbockers. Their stately repose and dignified bearing scarcely disturb the resemblance.

It may here be stated that not unfrequently the trachytic tuffs of various localities show a tendency to weathering in statuesque forms. Often differences can be observed in successive layers; and again, the admixture of quartzose matter will be productive of similar results. In the process of their formation, they are analogous to the sandstones above discussed. Dependent upon the composition, however, is the effect which sand-blast will have upon them. If the material is yielding—not brittle—then the transportation thereof will be much impeded.

Besides these localities, there are others in Colorado exhibiting similar features. Textural variations in sandstones, belonging to the Triassic and Cretaceous formations, are productive of forms that may be classed as statuesque. Taking into consideration, however, the occurrences best known, we may say that we shall not invariably expect to find such products of erosion exhibited in more than the two groups above mentioned—in the Upper Green River and in the lowest trachytic series. Others will more properly find their place in the class of "isolated forms".

MURAL FORMS.

We may appropriately distinguish two groups of mural forms: those resulting from partial removal of continuous series of deposits, and those primarily produced by the intrusion of foreign material within the limits of different deposits. The latter are of plutonic or volcanic origin, and, so far as entering into consideration here, may be comprised under the name of "dikes". Although a large portion of the erosive work accomplished is necessarily of the same character in both cases, the requirements for the production of the first group differ materially from those of the second. Under the definition of "mural forms", I place such products of erosion which may resemble single walls more nearly than any attempt at architectural design. From the nature of the subject it is evident that hard strata resisting erosion, if placed on end, may for a long time retain their position. By virtue of the stratigraphical disturbances they have taken part in, they have acquired positions which are merely rendered more prominent by erosion. They do not owe their present relations to surroundings primarily to erosion, and will, therefore, not be considered here.

A.—First Group.

WHITE RIVER REGION.

Near and on White River, within the same sandstone that is so prolific in the production of statuesque forms, we find very good illustrations of walls caused purely by erosion. The primary formation of valleys there has been discussed above. It may here be added, that the gradual transportation of material from between two ridges caused portions of the overhanging sandstones to drop down. Aided by the prevalence of joints or similar fractures, the disruption was more readily accomplished, the fresh surface exposed became more uniform in shape. If we carry out the widening and deepening of erosive valleys to such an extent that the ridges intervening between two of them will become very narrow, we may achieve the result of forming walls upon their crests. Purely fluviatile erosion could not accomplish this end unless by undermining, and then only if joints of sufficient extent should enable the rocks to drop down easily. Where only such erosion can exert its influence, we will often find vertical faces produced by undermining and subsequent falling down, but the summit of the ridge will be too wide to term it a wall: it will be a bluff, or even a sloping plateau.

In the vicinity of the White River we have, in fact, a sandstone thoroughly traversed by joint-fissures. At favorable localities, the early erosion by flowing water has cut narrow, deep channels into the rock, has evidently undermined, and does to-day undermine, certain portions, causing the strata above to break. Before the tension thus produced is relieved by the absolute disruption of the strata, the joints probably open more widely, causing an apparent downward flexure of the beds. Frost, and in part vegetation, rapidly produce a still greater widening of such fissures, and subsequent falls of rock-masses will take place. Eventually, by this means, the production of a wall, several hundred feet long, one hundred to one hundred and fifty feet high, and sixty to one hundred feet thick, can be achieved. Wherever they were found, they were observed to occupy prominent points, mostly on short, narrow ridges with very steep slopes. Series of what appear to be "walls" are formed of the same sandstone, and will be discussed under architectural forms.

Gradual denudation, the widening of fissures and seams, in the course of time breaks up the wall, and isolated columns are left to mark its former course and extent. Nowhere were the walls observed to have been formed to such perfection within Colorado as in the region of the White River. Undoubtedly the sandstones there are unusually well adapted to illustrate the various results of erosion. Their peculiar composition and the position they occupy have alike been favorable to subject them to the most intense and varied erosive action. During the first visit to this locality, the impression made upon the explorer is a very lasting one. On all sides the most curiously wrought and sometimes almost mystifying forms and figures beset the traveller. Day after day he may ride along the hills, and at every turn a surprise is awaiting him. Though that which may be seen here of such objects is not by any means unique, the enormous variety and the rich stores from which to select cannot but elicit admiration. Other products of erosion, too, are plentifully represented, some of which will be alluded to below. Erosion on a grand scale may be favorably studied in this region, and the evidences of the large masses that formerly have existed there create a profound feeling of surprise regarding the vast power that must have been utilized in transporting them.

B.—Second Group.

Dikes.

In quoting dikes as "products of erosion", it becomes necessary to define the basis upon which this is done. Dikes, strictly speaking, are certainly not products of erosion. They are essentially the casts of moulds formed by sedimentary or other rocks. Injected into these moulds—fissures in this instance—they either remain hidden from sight at first, or the injected material flows over and forms hills of greater or less extent. It is by the means of erosion, however, that dikes, resembling walls in all their essential exterior features, are brought to light, and become natural walls. Until this is accomplished, they remain foreign matter placed into most intimate relations with the general country-rock. Owing to the physical character of this rock, the dikes may either remain hidden, or they may eventually acquire positions entirely isolating them for a certain distance. In this case, they appear as mural forms, and enter into consideration in connection with erosive products. They occur very numerously, and apart from their relations to erosion are subjects of absorbing interest.

REGION OF SPANISH PEAKS.

One of the most highly favored regions in Colorado for the study of dikes is that of the Spanish Peaks. Located east of the main passes of the Sangre de Cristo Range they traverse the sedimentary formations. North of West Spanish Peak two dikes extend for the distance of 8 to 10 miles unbrokenly through the Carboniferous strata. Erosion, which may have required geological ages, has removed a sufficient amount of sedimentary material to let the narrow walls project for several hundred feet above the surrounding level. While the more easily disintegrated material was carried away, the hard, unyielding rocks composing the dikes have successfully resisted the repeated attacks. Preserving to a great extent features that even comparatively slight erosive action would efface, they have remained essentially intact. From the character of the volcanic material composing them it is evident that mechanical erosion will attack them but very slowly, unless preceded or accompanied by chemical decomposition.

Dikes, projecting as walls, occupy various positions. They may be found occurring on ridges and mountain-spurs, or they may extend for long distances in a level region. In the former instance, it is their influence mainly, either directly or indirectly, that permitted the formation of ridge or spur. By metamorphosis of the adjoining sedimentary beds, these may have been rendered better able to resist erosion, or the exposure of the dike-wall may prove to be a mechanical shelter for other less resisting portions. When the dike-wall succumbs to decomposition and erosion, it ends in the same manner as the walls above described. Portions of it break down, destroying the continuity, until finally rock-pillars alone remain to mark the former course.

Throughout Colorado, dikes occur more or less frequently. They are very uniform in their behavior regarding erosion, however, and as only their wall-like appearance upon the surface here becomes of interest, it is unnecessary to allude to more of them. What has been said above will hold good for all occurrences of this nature. In geographical nomenclature, their influence upon the character of scenery and landscape has been acknowledged. Names like "Fortification Creek" and "Muralla Peak" denote the existence of the typical wall-like projections of volcanic rock.

During 1875, Mr. Holmes had occasion to explore Southwestern Colorado. From Navajo Creek, he publishes a very interesting sketch of a double dike-wall.* The volcanic material there protrudes through Lower Cretaceous strata. Subsequent erosion has removed the sedimentary material surrounding it, so that at present the double wall extends upward perfectly isolated. By the various remnants indicating the trend of the dike, Mr. Holmes found its length to be more than a mile.

Few occurrences, perhaps, can furnish us with data so reliable for determining the quantity of erosion as the existence of these dike-walls. It may here incidentally be mentioned, that not unfrequently the casts of edges of strata may still be found upon the sides of such walls, and they certainly furnish an applicable indication as to what relative height the sedimentary beds must at one time have extended.

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*Rep. U. S. Geol. Surv. for 1875, p. 276.

ARCHITECTURAL FORMS.

As in the preceding class, so here, too, we have essentially such forms which are produced directly by erosive action and such that are merely made more prominent thereby. In case of stratigraphical disturbances, hard strata may acquire positions which render them of great importance in the landscape. By the removal of certain portions, displaying more striking features, perhaps, than otherwise would have appeared, erosion certainly does its share toward increasing their characteristics. It is necessary only to quote Cathedral Rocks near Monument Park as an instance of this kind. There the strata stand on edge, rising in vertical columns for more than 400 feet. Erosive action has modified and determined detail-features, but its effect had nothing to do with the present position of the rocks. In discussing architectural forms, we can appropriately distinguish two groups: such representing either complete or ruined structures, and such simulating architectural ornamentation. Both of these are well developed in Colorado, more particularly the latter. At numerous localities are they found, and the number of varieties they present is very great.

A.—First Group.

WHITE RIVER REGION.

In this region it is again the Upper Green River sandstone that enters into consideration. The formation of eroded walls has been discussed above. Architectural forms are but a series of walls in this instance. Mainly the prevalence of joint-fissures and undermining by fluviatile erosion caused the occurrence of the remarkable forms here observed. On the north side of the river, the bluffs rise to a relative elevation of more than 2,000 feet. For a considerable distance, the highest portions of these hills are covered by products of erosion closely resembling ruins of houses and castles. Erosion here has been carried on on a grand scale. Enormous masses of sandstones have become detached by undermining and frost, and have rolled down far below their original positions. Vertical faces, often regular as though cut by hand, mark the places whence these masses came. For the purpose of indicating the effect produced by these curious conditions I quote from a letter:—"On the north side of the river a perpendicular wall rose to the height of 500 feet, and innumerable walls and turret-shaped rocks ornamented the steeply sloping summit. Seen thus by the slanting rays of a setting sun, the effect was that of a ruined city. A mighty citadel occupied the highest point, fortified on every side by vertical walls. Below all this was the bright green valley with its meandering river, which reflected the rosy hue of an evening sky."

This "ruined city" is built upon a rapidly rising slope, in terraces, resembling somewhat in its general plan Oriental arrangement. Dark shadows are cast into the narrow streets, and curious detail-erosion has peopled the city with fantastic beings. Altogether it produces the impression of a weird spot, resembling the former abode of living creatures, but now desolate, haunted scarcely even by a shy, cringing wolf. Upon closer examination, however, much of its mythical character is dispelled. Too plainly are recognized the forces that have been at work to accomplish the result we observe. What has been said about the composition and formation of mural forms will here apply. On a grander scale the agents employed have been able to perform their duties, and have built for themselves, in this ruined city, a monument most instructive and imposing.

Forms resembling castles, towers, and spires can readily be found within this sandstone area, due to the same causes operating with the same effects.

LA PIEDRA PARADA.

Near the junction of Rio Piedra and Rio Nutria, at about west longitude 107° 18′ and north latitude 37° 17′, is located a famous landmark, La Piedra Parada. On the summit of a narrow ridge stands an isolated mass of rock. It is only with difficulty that the top of it can be reached. Rising nearly vertically on all sides, this remnant of formerly extensive strata attains a height of about 400 feet from its base. It is over 600 feet long, and about 120 feet wide.* Alternating beds of shale and sandstone compose it, and heavy strata of yellow sandstone form the top. During the progress of maximum erosion in that region, enormous masses of material were swept away, but this huge block remained. Subsequent weathering and disintegration have ornamented it with small towers and turrets, so that to-day it resembles some ancient, dismantled castle. Constantly fragments, loosened by frost, are falling down. Joint-fissures, very pronounced, facilitate the wedging action of frost and growing vegetation, so that, in the course of time, this prominent feature will no longer remain a portion of the scenery.

B.—Second Group.

GUNNISON RIVER.

North of the Gunnison, in the regions examined by Dr. Peale during 1874, are large outcrops of trachytic "breccia". This material has been eroded into innumerable forms representing spires, columns, turrets, and castle-shaped masses. Its composition, here as well as elsewhere, fits it admirably for imitating forms that can readily be compared to those of Gothic architecture. The form of the spires is similar, and the numerous inclosed bowlders of varying size produce effects comparable with the ornamentation of Gothic structures. At a number of points, such conditions were noticed, often producing singularly beautiful pictures. Perhaps one of the most striking views may be obtained from the summit of Uncompahgre Peak (14,235 feet above sea-level). Looking down from there upon a vast mass of rugged mountains, we find that to the north and west the trachytic conglomerates occupy a definite horizon. Thousands of spires are clustered along the sides of mountains, rivalling, as it were, the densely studded spires of that gem of Gothic architecture, the cathredal of Milan. Situated as they are, they stand out in bold relief when viewed from below, but seen from above they produce a profound impression by their great numbers.

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* Compare Report Exploring Expedition, J. N. Macomb, 1859, 1876, p. 78.

Primarily erosion by flowing water cut deep, narrow channels into the yielding material, forming sharp ridges, which soon were separated into detached portions. Subsequent erosion, every agent available being employed, wrought the curious and rare forms we now observe. Removal of the harder beds overlying the conglomerates affords free access to water, and though many of the spires and towers may disappear in a comparatively short space of time, the supply of fresh material is practically inexhaustible.

Other products of erosion might appropriately be placed into this group. Differences of density in rocks, more particularly parallel to the planes of bedding, will cause fluviatile as well as pluvial erosion to carve them into unique forms. Shelved and scolloped edges of plateaus and bluffs, segregation into regular and highly ornamented columns, and minute decorations thus produced, might well be employed as models for the hand of the artisan.

CAVES.

Caves that owe their formation to erosion may be formed in two different ways. They may be due to either chemical or mechanical action. By means of decomposition and by subsequent removal of the material, either mechanically or in solution, the first effect is accomplished. Many of the smaller caves in limestone, for instance, were formed by a solution of the carbonate of lime in water charged with carbonic acid gas. The second group, the one which we shall here discuss, is formed by erosive agents, which are usually recognized specifically as such. As the initiatory step toward the formation of a cave, or as the most primitive form thereof, we may regard the results produced by fluviatile action in undermining certain portions of rocks or strata. Dependent upon the local force of the water and the cohesive qualities of the overhanging material, "shelves" of considerable extent may frequently be produced. In tough shales, such as are found in some of the Tertiary groups, we may often find excavations of this kind of appreciable size. Sandstones, if massively bedded, are eroded in the same way, and retain the form of shallow caves for a considerable length of time.

FRONT RANGE.

Along the eastern border of the Front Range many of the sandstones there exposed show interesting results of erosion. Shallow caves have been worn into the yielding rocks, dependent upon their more or less firmly cemented condition. Within the region containing monuments, such caves are of frequent occurrence. They may be worn into the sandstones by flowing water, or they may be due to gradual disintegration and transportation of certain circumscribed portions. The method producing caves of this character is so simple that it scarcely requires discussion. Frost, rain, or other agents may start a shallow abrasion of the sandstones, which, in the course of time, will extend toward the interior, forming a cave-like excavation. Similar conditions occur wherever sandstones of the same composition are exposed to fluviatile or other erosion. The shape of such caves is a very simple one, being merely an arched excavation, the plan of which usually resembles either half a circle, or, if very extensive, the segment of a large circle. Modifications of this shape take place in case water finds a free passage through fissures in the rocks into the cave. Hard masses contained within the sandstones, either as impregnations or concretions, remain less disturbed than their surroundings, and form irregular projections on the cave-walls.

CAVES IN TRACHYTIC CONGLOMERATES.

Cave-like excavations are thoroughly characteristic of the trachytic conglomerates. While speaking of monuments, the composition of this deposit has been discussed. It is evident that material of such character will very readily be attacked by both fluviatile and pluvial erosion. Furthermore, the results produced will vary according to the local character of the conglomerate. Within the exposures on South River many caves were found. Sometimes they are but slight niches worn into the steep wall, and again they may extend for more than 30 feet into it. From what was there observed, it is certain that frost loosens a large portion of the material which is afterward removed. So far as could be seen, the action is essentially a mechanical one, although decomposition of various feldspars greatly facilitates it.

Along the western border of the San Juan Mountains, a large mass of conglomerate of this nature lies exposed. Even from a distance it can easily be recognized on account of the rugged and grotesque forms it assumes upon weathering. Dark spots seen before it is reached mostly prove to be more or less shallow caves. Near Piedra Falls a number of these were found. It was there noticed that the largest one, about 25 feet high, 18 feet wide, and 40 feet deep, owed its existence to the presence of slowly moving water. The opening of this cave, which is its widest part, is located in a steeply sloping, smooth wall of conglomerate. In a narrow crack, water slowly trickles down to the top of the opening. Although, in the course of ages, even this slightly wearing movement can produce a visible effect upon the rock, it is not—as a movement—the cause which led to the formation of this wide opening. At that point the conglomerate varies considerably in composition. In the immediate vicinity of the cave, it is softer, contains fewer large bowlders, and these are but loosely cemented by clay and feldspathic material. Saturation of this rock and subsequent expansion of the water upon freezing cause portions of the roof and walls to "scale off". After some of the cementing material has been removed, the bowlders, no longer held in place, drop out, thus gradually enlarging the excavation. As soon as such portions of the rock are reached that are sufficiently cohesive to resist this action, the growth of the cave will come to an end. Ample evidence was found at that point to demonstrate that this was really the method of formation. Masses of *débris* on the floor of the cave and dangerously loose bowlders overhead corroborated other evidence. Indians and wild animals have not unfrequently utilized these and other caves as places of shelter. Remnants of charcoal indicate the places where at one time fires had been built. One of the most striking examples where such caves or excavations produced by fluviatile erosion have been utilized by man may be found in the ruins of the old cliff-dwellings in Southwestern Colorado. Several of the streams there have worn long and deep recesses into the readily yielding sandstones and shales prevailing in that region. Into these, single houses and entire settlements have been placed by the shrewd aboriginal inhabitants. Although often removed a considerable distance from water, the architects of those times preferred to take advantage of the places which nature had prepared for them. Both shelter and protection from enemies were afforded them, and they adapted their style of building to the places which they chose for the purpose. In the various publications of the Survey, full accounts of these dwellings will be found.

ARCHES.

Arches, or "natural bridges", as they are frequently termed, can be formed wherever the rock containing them is sufficiently thin to be perforated by erosive action. We have here to consider mainly such arches the genesis of which is directly referable to agents of erosion. Viewing them from this standpoint, we may say that an arch is the most complete form of a cave. If the material containing the latter should be sufficiently thin to allow erosion to progress throughout its entire extent, then we will have the former as the result. It is evident that definite conditions, perhaps not often met with, must exist before we can expect an arch to be completed. Necessarily such products will show much variation in form and size, dependent upon the material through which the opening extends. In limestones not unfrequently the existence of an extensive fissure will eventually result in the formation of an arch. This is due, in a great measure, to chemical action. Instances are on record where hills are traversed by a narrow natural tunnel in limestone. Genetically considered, this is an arch, but to the popular mind does not present itself as such.

IN TRACHYTIC CONGLOMERATE.

The scenery on South River has been described in previous pages, and allusion has been made to the arches occurring there. It will be remembered that high, narrow walls of conglomeritic material are projected toward the stream from the ridge east of it. In these walls, niches and arches are found, some of them of surprising regularity. While making our observations there, we counted altogether eleven complete arches, although more may have been hidden out of our sight. Mr. Rhoda was the first one of the party who successfully ran the risk of climbing along ledges on the wall in order to get into one of the arches. To him, therefore, has been dedicated the one represented by an illustration in the Annual Report for 1875 (Plate XX, page 158). A description of this one will answer entirely for all others there observed, as in general shape and method of formation they are very nearly alike. Rhoda's arch is probably the most regular one in outline. A slight leaning toward the eastward somewhat disturbs its symmetry. Located in a high wall, this arch shows ample dimensions. It is about 180 feet high, 150 wide, and the wall containing it has a thickness of 60 to 80 feet. Surrounded by monuments, some of which reach a height of more than 200 feet, the entire view from the point where the sketch was made is one of rare beauty. Pine-trees, 30 feet high, at the base of monuments, appear like pigmies by the side of these towering forms.

Some of the niches or arches at this locality were comparatively accessible, and it was found that they were eroded into loosely cemented material. Considering that these conglomerates have been deposited by water, we should expect homogenousness laterally, although variations would probably occur vertically. We have, however, in this instance a case analogous to that of the sandstones near White River. By a slow process of infiltration, the large mass has either been rendered more compact, or—reversing the proposition—a process of leaching has rendered certain portions very weak. Either of these suggestions may contain the statement of what has really occurred, because, so far as our observations extend, we find that the physical constitution of the material in which niches and arches occur is such as to render it more easily yielding to erosive action. Taking into consideration the method of deposition of the conglomerates, it seems illogical to assume that this state of affairs existed ever since the time of its formation: we must therefore seek for a cause to explain the phenomenon.

What has been said of the formation of caves within the conglomerates applies perfectly to the arches. They are, in reality, nothing but caves which extend entirely through the walls. It is probable that both sides were simultaneously attacked. This would account in a measure for the regularity of outline. Whichever portion of the wall was exposed to the "weather side" was cut away more rapidly than the other.

In connection with this subject it may be stated that not unfrequently compact trachytes contain inclusions, of greater or less extent, composed of soft "ashy" material. These, in the course of time, will weather out, forming caves and sometimes arches of varying extent. Wherever we observed occurrences of such character in Colorado, they were so situated as to afford ample opportunity for the removal and ultimate transportation of detritus, excepting a very few cases. These latter were such where the fall of loosened material had evidently been a sudden one, and of considerable quantity.

On the eastern slope of the Sangre de Cristo Range, near Indian Pass, a small "gateway" was observed occurring in red Carboniferous sandstone.* Standing perfectly isolated near the crest of a small ridge was a block of sandstone about 10 to 12 feet high. Near the centre were two openings; the upper one small, the lower one large enough to admit the passage of a man. At first sight, this peculiar position for an arch seemed rather inexplicable. Upon examination, however, it was found that five different strata composed the block. Counting from above, the first, third, and fifth strata were hard, the second and fourth soft. A vertical crack runs through the entire distance of the block. Water collecting in the crack saturated the soft strata and eventually accomplished their disintegration. Aided by frost and sand-blasts, the crumbling sandstone soon fell away, producing the openings we observed. This instance is one where only atmospheric agents could reasonably be supposed to have exerted any influence. Although this is an unusually clear case, it points out a method whereby excavations of some extent may be produced at places where they can by no means be so readily explained.

At various localities along the Front Range, arches occur in the sandstones. Besides the causes above mentioned as facilitating the formation of such products of erosion, still another may be mentioned. In case flowing water undermines a certain stratum or series of strata, and continues this process for a long time without the overhanging portions caving in, the entire width of the dividing portion may be cut. Thus a subterranean passage of varying dimensions will be formed. This form of arch is usually designated as a "tunnel", limiting the former term to such occurrences where but a narrow wall of rock is perforated. The ingenuity of man has likened these products to various other objects dependent upon their form and dimensions. Many of them are compared directly to the works of man. In Europe, wide and deep arches are often called "barns". Such appellations as "natural bridge", "gate", "gateway", "tunnel", and others, designate each a definite class of forms. They are too generally understood to require any discussion as to etymology and comparative applicability. Occurrences of this character have always been invested by man with more or less mythical interest, and many a legend is told which stands in the most intimate connection therewith.

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* Compare Annual Report for 1875, Plate XX.

ISOLATED FORMS.

As "isolated forms" we may regard such that vary in their distribution and mode of occurrence from the classes above enumerated. Taking for instance the trachytic conglomerates: we may regard the occurrence of grotesque forms within that group as a characteristic thereof. It is an essential feature, and one that may readily be employed in determining this recognition. In contradistinction thereto, isolated products of erosion are such that occur only sporadically in geognostic groups or formations where they would not be expected. Some peculiar circumstances may combine to produce such results, and in vain may similar forms be looked for at other localities within the same horizons. From the nature of the case, it is evident that the isolated monumental products will occur comparatively rarely, and that they will show a great diversity of composition and shape. Only a few such instances will be mentioned from Colorado as comprising the most prominent representatives of this class. Extensive erosion within certain regions will necessarily result in the formation of objects that would appropriately be placed under this head, but for our purposes it will be entirely sufficient to refer to but a few of them.

LIZARD'S HEAD.

The Mount Wilson group is located a short distance west of San Miguel Lake, in west longitude 107° 59′ and north latitude 37° 50′ Descending by the Bear Creek trail from the divide between Rio Animas and San Miguel drainage, we see before us a steep, downward slope which abruptly terminates in the valley of the last-named river. Two thousand feet below us lies the placid sheet of water which receives its name from the river. Looking beyond it toward the northwest, we see the mountain mass of the Wilson group rising high up in bold relief. An elevation of 14,280 feet is reached by the main peak, the summit being nearly a mile higher than the lake. Prominent in the mountain group we notice a "needle" standing near its eastern edge.* From a distance it appears insignificant, but we can easily determine that it must be of large proportions in order to be seen at all. As we approach closer, we find that a comparatively regular pedestal has been formed, supporting an enormous monolith. Steep slopes lead up to its base, broken often by vertical walls. From this base rises a gigantic rock-column, 290 feet in height, while its diameter amounts to from 60 to 80 feet. Its isolated position permits it to be seen for a long distance, and its elevation—13,160 feet above sea-level at the summit of shaft—renders it an excellent landmark for all the lower country adjoining.

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*Compare Annual Report for 1874, fig. 2, page 207.

Both the rocks composing the Wilson group and those which the monolith—Lizard's Head—exhibits, are of volcanic origin. In former geological periods enormous masses of sedimentary and volcanic material have been eroded and transported from that region. It seems possible that a former connection existed between the ridge now supporting Lizard's Head and the main volcanic group farther east. No surface connection exists at present, however. All that remains in the immediate vicinity of them is the huge monolith. During the period of the great erosion, valleys were cut into the rocks and ridges were gradually carved away so as to become narrower and shorter. Probably the disturbances produced by eruptions of volcanic material, and, more particularly, the phenomena accompanying them, rendered the rocks of that region less capable of resisting such powerful agents of demolition as were then employed. It may be observed that the trachytes composing Lizard's Head show a certain development of columnar structure. This structure is almost invariably accompanied by basal fracture-planes. By this means, erosion will be enabled to attack such portions more successfully. A process of undermining will result in the falling of overhanging portions. Owing to the columnar arrangement of the integral parts composing a hill or bluff, the faces produced by such falling will be quite or nearly vertical. In this manner, fluviatile erosion can produce, from such material, a type of form which is represented by Lizard's Head. Had the erosion continued on at the same level, the entire mass must have succumbed. Increasing width and depth of the excavated valleys, however, caused the waters to sink. Thereby the same species of erosion was produced along the sides of that portion which now forms the "pedestal", but the column remained intact. This appears to be the only way of accounting for the existence of Lizard's Head. It is not a dike or intruded volcanic product, subsequent to the main eruptions, but a portion of the regular flows, large masses of which are still preserved not far distant.

Similar in shape are the forms resulting from a partial breaking-down of mural products of erosion. Their arrangement, however, and the character of the rocks composing them, will admit of their ready identification.

Another important group of isolated forms of erosion comprises such that are produced by local inclusions of essentially foreign material. Concretions may be contained quite frequently in shales and sandstones. Those to which we have special reference here are harder, resisting erosion and disintegration more effectually than the rocks containing them. Forms similar to those of the monuments may be produced by a gradual wearing-away of the portions adjacent to concretions. Among the Upper Cretaceous sandstones, and among those belonging to the lignitic series, this is especially noticeable. Although occurring comparatively frequently, the phenomenon cannot be regarded as a characteristic of either of these groups. In a general way, this feature is comparable to the irregular density of the sandstones of the White River region. As soon, however, as this irregularity assumes the extreme form of concretions, we can no longer expect that great variety of fantastic figures there exhibited, because concretionary inclusions are usually shaped after the same general type.

Before closing the discussion of erosive products, I desire to point out one feature of fluviatile and pluvial erosion that is as instructive as it is beautiful, the carving of uniformly homogeneous deposits. In Colorado, ample opportunity is afforded to study this interesting phenomenon. More, perhaps, than by any other geological group, it is exhibited by the soft shales, comparatively free from sand, of the Cretaceous formation. Frequently may be found bluffs or ridges the sides of which present a most typical miniature arrangement of hills, valleys, mountains, and cañons. What is here accomplished in a comparatively short time on so small a scale, nature's power has successfully completed in successive ages on a scale incomparably greater. Time and the never-ceasing activity of erosive influence produce results that at present fill us with astonishment and admiration. Changing from day to day, in a degree imperceptibly small to us, geological periods have been required to produce what we now see. Nothing, perhaps, expresses more aptly the lesson taught, by observing the effects of erosion than the old Roman verse:

"Gutta cavat lapidem non vi,
Sed sæpe cadendo."

ART. XXXVI.—PALEONTOLOGICAL PAPERS NO. 8: REMARKS UPON THE LARAMIE GROUP.

BY C. A. WHITE, M. D.

In other writings* I have shown that all the principal brackish-water deposits of the Western Territories are properly referable to one great group of strata which represents a period of time whose importance in the geological history of the North American continent increases with our knowledge concerning it. The members of the Laramie Group as now understood are the Judith River and Fort Union beds of the Upper Missouri River region; the Lignitic Series east of the Rocky Mountains in Colorado; the Bitter Creek Series of Southern Wyoming and adjacent parts of Northwestern Colorado, and the "Bear River Estuary Beds", together with the Evanston Coal Series† in Bear River Valley and their equivalents in adjacent parts of Wyoming and Utah. These, at least, are the best-known members of the Laramie Group; but it has a much wider geographical extent than even the widely separated localities just referred to would indicate. Some of the known portions of this great group doubtless represent different stages of the Laramie period, but the members just designated are, as a rule, understood to represent different geographical developments of its strata with modifications of its fauna, rather than separate successive epochs of time in the geological period which is represented by the whole great group. The proof of the identity of these widely separated portions of the Laramie Group consists in the recognition of various species of fossil mollusks in all of them that are also found in some one or more of the others, thus connecting the whole by faunal continuity. Similar proof has also been obtained by Professor Cope in the discovery of certain species of vertebrate fossils in more than one of these geographical members of the Laramie Group.

The entire geographical limits of the Laramie Group are not yet fully known, but its present ascertained extent may be stated in general terms as from Southern Colorado and Utah, northward into the British Possessions; and from the meridian of the Wasatch Range, eastward, far out on to the great plains. Its extent north and south is thus known to be about 1,000 miles, and east and west a maximum of not less than 500 miles. The full length of the area once occupied by the group is probably considerably greater than here indicated, and we may safely estimate that it originally comprised not less than 50,000 square miles. The present range of the Rocky Mountains traverses this great area, against both flanks of which, as well as those of the Black Hills, the Laramie strata are upturned. These mountains, therefore, did not exist during the Laramie period, and the continuity of the waters of the Laramie Sea over their present site is also shown by the specific identity of aqueous molluscan fossils in its strata on both sides of those mountains.

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*See Bull. U. S. Geol. and Geog. Surv. Terr. Vol. IV, Art XXIX, and An. Rep. U. S. Geol. and Geog. Surv. Terr. for 1877.

†Sometimes called the "Almy Mines", from the name of the small mining hamlet where the mines are located.

The prevailing material of the strata, especially those of Mesozoic and Cenozoic age, in all the Western Territories, whether of marine, brackish-, or fresh-water origin, is sand; and consequently those of most of the groups have certain characteristics in common.

Not only in this general way, but in other respects also, the lithological characteristics of the Laramie Group are similar to those of the Fox Hills Group of the Cretaceous Series, upon which the former group rests, and with which, so far as is now known, it is everywhere apparently conformable;* that is, it has the appearance of a widespread marine formation, consisting mainly of sandstones and sandy shales; but that it was not, like the Fox Hills Group, an open-sea deposit, is shown by its fossils. Its resemblance to the Fox Hills Group is still further increased by the presence in the latter, as well as the former, of many important beds of coal. It is true that no coal has been found in the Fox Hills Group in the Upper Missouri River region, nor in Eastern Colorado, but it is not uncommon among the strata of that group in Wyoming, Utah, and Western Colorado.

Although there is sufficient evidence that the Fox Hills Group, which immediately preceded the Laramie, was deposited in a comparatively shallow sea, the bottom of which was slowly but constantly subsiding, its waters seem to have been everywhere truly marine except in a few estuaries;† and the whole area occupied by the group where it has been studied seems also to have been always and entirely submerged, except, perhaps, those surfaces upon which the coal-plants grew, and these could have been above the water-level only during the growth of that vegetation and the accumulation of its carbonized remains. The Laramie Group seems also to have been deposited in waters that were constantly shallow, and as the group has a maximum thickness of not less than 4,000 feet, the bottom must have been constantly subsiding.‡

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*There must necessarily be some unconformity between these two groups in the peripheral portions of the Laramie, because, as will be shown further on, the area upon which its waters rested was cut off from the great open sea by the elevation of portions of the bottom upon which the Fox Hills deposits were made.

†An interesting assemblage of fossils from a deposit of one of these estuaries has been obtained near Coalville, Utah.

‡Similar remarks may be made concerning all the other groups of the Western formations from the Jura Trias to the Bridger Group inclusive, as will appear further on.

In all places where the group is known, and from its base to the top, the majority of its invertebrate fossils are brackish-water forms, and yet in the same places and throughout the same vertical extent, a greater or less number of molluscan species occur that are referable to either a fresh-water or land habitat. In many instances, the fresh-water species occupy separate layers from those which contain the brackish-water forms, and alternate with them, but it is very commonly the case that both fresh- and brackish-water types are found to occupy the same layers, the condition of the specimens of both categories being such as to forbid the supposition that either of them was drifted from elsewhere to their present places of deposit and association. For example, numerous specimens of *Unio*, of many species, have been found associated with equally numerous specimens of *Corbula* and *Corbicula*, a large proportion of all of which still retain both valves together in their natural position. Associated with these, and in a similarly unmutilated condition, there are other molluscan remains, the living representatives of which are respectively of fresh- and brackish-water habitat; and all of them are in such condition as to force the conclusion that they all lived together. The general prevalence of brackish-water types throughout the group, including *Ostrea* in abundance, *Anomia* quite plentiful, with occasional examples of *Nuculana* and *Membranacea* (or a closely related polyzoan), leaves no room for reasonable doubt that the prevailing condition of the Laramie Sea was saline; but the absence of true marine species proves that its waters were cut off from the open ocean. The conditions and association of species just explained show also that there must have been in certain places and at different times an alternation of greater and less saltness of its waters.

It is well known that some species at least of certain genera of mollusks are capable of living in both brackish and fresh waters, but the evidence seems conclusive that certain forms found in the Laramie Group, the living representatives of which are respectively confined to either a fresh- or brackish-water habitat, then not only lived but thrived together in the same waters; and also that those waters were in some degree saline. This commingling of brackish- and fresh-water types is not exceptional in the Laramie Group, but quite common, yet there are layers in some places, as for example near Black Buttes, in which all, or nearly all, the *Mollusca* are ot fresh-water type. A statement of these facts naturally suggests that this commingling of brackish- and fresh-water forms took place in estuary waters, and that the strata containing them are estuary deposits. But the character and condition of the strata show that this is not the fact, or if so in any cases, they are rare and at present unknown exceptions to the rule. While there were necessarily tributary streams flowing into the Laramie Sea, and true estuaries at the mouths of at least a part of them, I do not know of a single deposit or part of one in any district or in any of the divisions of the great Laramie Group that presents the stratigraphical characteristics of an estuary deposit.

Judging from the characteristics of existing land-locked seas, it is difficult to understand clearly how fresh and brackish waters could have existed in one and the same sea in the absence of, or at a distance from, the mouths of tributary rivers; but the character of the deposits of the Laramie Sea, as well as its molluscan fauna, warrants the suggestion that many comparatively large portions of its area were, at different times and in different places, in the condition of marshes, which were only slightly raised above the general water-level, upon which fresh waters from rains accumulated, and gave congenial habitat to such members of the molluscan fauna of the period as would preferably avoid the brackish waters. This view is supported by the occasional presence of land-shells among those of branchiferous mollusks, the more common occurrence of palustral shells, the occurrence of deciduous leaves, and other fragments of vegetation, all in the same or associated strata; and also the presence of numerous beds of lignite throughout the group. It is also supported by the fact that the fossil *Mollusca* are found, not uniformly distributed throughout the group, either vertically or geographically, but to occupy small, distantly separated areas, which are not only locally restricted, but within which locally restricted areas the vertical range of the different species is limited. Admitting that such conditions prevailed, it is easy to understand how it may have happened that certain layers containing the remains of *Mollusca*, which could have flourished only in salt or brackish waters, as, for example, *Ostrea* and *Anomia*, are found to alternate in close succession with those containing an abundance of fresh-water species, and also with those containing a commingling of types. The conditions thus indicated would have brought the brackish- and fresh-water habitats of those *Mollusca* into such juxtaposition that they must have frequently encroached upon each other. This frequent encroachment, or mingling of habitats, and, no doubt, the frequent impracticability of retreat, would have had a tendency to inure at least a portion of the mollusks of each to an existence in the other. It is evident that many of the Laramie species were capable of such an interchange of habitat without disadvantage, and that among these were certain species of the *Unionidæ*, *Ceriphasiidæ*, and allied families.

In expressing the belief that, with the exceptions referred to, the Laramie Sea was a great body of brackish water, I have not lost sight of the fact that some living mollusks belonging to families that are regarded as of distinctively marine habitat are known to inhabit fresh waters; nor of the fact that some others which are regarded as of fresh-water types are occasionally found in brackish waters. It seems impossible, however, to account for the commingling of types which we find in the Laramie strata, except by assuming that they all lived and thrived together in the same waters, as before stated.

Before leaving the discussion of the general characteristics of the Laramie Group, the existence in it of a remarkable local or regional molluscan fauna should be noticed. All the branchiferous species of *Mollusca* of the lower or brackish-water beds of the Laramie Group of Bear River Valley and the adjacent region are different from any of those yet found in any other part of the Laramie Group. Besides this, there are two or three generic or subgeneric types among those mollusks that have never been discovered elsewhere. This statement applies only to those beds that have been so often called the "Bear River Estuary Beds", and not to the upper or coal-bearing beds of Bear River Valley, as developed near Evanston, Wyo.; for, in the latter, a few species have been recognized as identical with some that are found in other and distant parts of the group.* Because of the general character of these Bear River brackish-water strata, and their relation to those both above and beneath them, no reasonable doubt can be entertained that they form an integral part of the great Laramie Group, notwithstanding the unique character of a large part of their fossils. The existence of that remarkable local fauna in the Laramie Group has a parallel in the similarly restricted and unique fauna that is found in the Cretaceous series of Coalville, Utah, and the region adjacent, extending as far northward as the valley of Bear River, where the Laramie beds before referred to are exposed. The faunal differences in both cases were probably due to a similar general cause, and that cause probably had relation to the proximity of a then existing western continental coast.

Having briefly considered the distinguishing characteristics of the Laramie Group, its relation to the other groups will be better understood by a brief review of the physical conditions of that portion of the North American continent which it occupies, together with the portions adjacent. Much remains to be known upon this important subject, but the facts hitherto ascertained seem to warrant the following statements and conclusions:—

East of west longitude 95°, North America is mainly occupied by Paleozoic and Archæan rocks; as is also a large area which extends northward and southward through Western North America; the eastern border of the latter area being adjacent to the region here discussed and not far from the one hundred and thirteenth meridian of west longitude. These two great areas are taken to represent approximately the outline and extent of the principal portions of the North American continent that were above the level of the sea at the beginning of the Mesozoic time. A broad expanse of Mesozoic sea then stretched between these two continental factors, which were finally united by a general continental elevation, and the consequent recedence of the sea. This elevation was not, properly speaking, catastrophal, but gradual and oscillatory. That intercontinental Mesozoic sea was narrower during the Jura-Trias period than it was in the next epoch afterward, but it was always shallow, as is shown by the lithological character of the strata of all the Mesozoic formations; and as these aggregate a great thickness, there was, of course, for a long time, and over a very large part of the space which it occupied, a gradual subsidence of the bottom which allowed the successive deposition of shallow-water formations. The following facts prove the occurrence of oscillations of land-surface and sea-bottom by which from time to time the eastern border of the Mesozoic sea was shifted, and the whole finally displaced.

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* In consequence of a misplaced label, I erroneously referred *Macrocyclis spatiosa* Meek, to the Judith River beds, in the table on p. 722, Bull. U. S. Geol. and Geog. Surv. Terr. vol. iv.

In Western Iowa, Eastern Nebraska, and Eastern Kansas, the Cretaceous strata are known to rest directly upon the Carboniferous strata, the Jura Trias being absent. These last-named strata, however, are in full force where the Mesozoic rocks are turned up against the eastern flanks of the Rocky Mountains and Black Hills, as well as farther westward. Their eastern border is certainly somewhere in the great plains beneath later Mesozoic formations and the prevailing surface *débris*, but its location is not even approximately known. Cretaceous strata continuous with those of the West are known to have been deposited as far eastward as within 50 or 60 miles of the Mississippi River in Northern Iowa and Southern Minnesota; southward from which region their eastern border gradually recedes to the westward nearly as far as Central Kansas. In the northeastern region just named, it is the attenuated strata of the Fort Benton and Niobrara Groups that are found, and these rest directly upon the Paleozoic rocks, the Dakota Group being absent there. In Western Iowa and Eastern Nebraska, the strata of the Dakota Group are found to rest upon the Paleozoic rocks, the former extending farther eastward there than any other Cretaceous strata; but the eastern borders of the Fort Benton and Niobrara Groups are not there very far to the westward. The eastern border of the Fort Pierre and Fox Hills Groups, or the Later Cretaceous, is still farther westward, but its position is hidden by the later formations and the prevailing *débris* of the plains.

From the foregoing facts, the following inferences may be legitimately drawn:—During the period represented by those Western rocks which have received the designation of Jura Trias (and apparently during a portion of the Permian period also), the western shore-line of the eastern or principal continental factor was extended so far westward that the eastern border of the deposits of the period referred to reached no farther eastward than along some line now far out on the great plains, but the location of which is not known. It is now covered from possible discovery by superimposed Mesozoic strata and the prevailing surface *débris*. At the close of the Jurassic period, a subsidence took place, which carried the deposits of the Dakota Group nearly as far eastward as Central Iowa. Still later, continued subsidence, but of more limited extent to the southeastward, caused the deposition of Fort Benton and Niobrara strata still farther eastward, in Northern Iowa and Southern Minnesota. At or before the close of the Niobrara epoch, the elevation of the western portion of the eastern or principal continental factor was resumed and apparently continued without further interruption by any other subsidence sufficient to carry any of the recovered or added land-surface again beneath the level of the sea; although portions of the area which the intercontinental Mesozoic sea had covered were afterward occupied by great bodies of both brackish and fresh waters. The eastern border of the later Cretaceous deposits was thus carried westward, where its place is now covered like that of the border of the earlier Jura-Trias deposits, but not so deeply.

The eastern border of the Laramie Group is hidden in the same manner, but there is yet no evidence that it is anywhere overlapped by any subsequent *marine* deposit; although it is known to have received upon it in several places different groups of fresh-water strata. Perhaps no fact in the physical history of North America is better established than that the elevation of the Rocky Mountains as such are of later date than the Laramie Group, but the foregoing facts show that both oscillatory movements and general continental elevation took place before the beginning of the movements which resulted in the elevation of those mountains. Besides the oscillations of surface which have already been mentioned, there are indications that other similar movements occurred elsewhere within the same limits of time; such, for example, as the unconformity of the Laramie strata upon those of the Fox Hills Group in Middle Park, reported by Mr. Marvine; the unconformity in some places of the Jura Trias upon rocks older than the Carboniferous, &c.

But leaving now the subject of the elevation and subsidence of land-surface to be briefly resumed further on, a few facts concerning the former physical conditions of what is now the western part of North America may now be considered. No fresh-water deposits of any kind or extent have yet been discovered in any of the Paleozoic rocks of North America, unless the coal of Carboniferous age may be regarded as such; but even in that case the elevation of the land upon which it was formed could have been only barely above the sea-level; for the conformity of the coal-beds with the strata immediately above and below them is never broken, and the latter strata contain marine fossils. Therefore, for our present purpose, all the Paleozoic strata may be regarded as of marine origin. As a rule, also, all the Mesozoic strata, from the Jura Trias to the Fox Hills Group inclusive, are, by the character of their fossils, known to be of marine origin, although at a few localities in some of the strata of each period fresh-water *Mollusca* have been discovered. These exceptions no doubt indicate the proximity of then existing shores rather than the prevalence of any such bodies of either brackish or fresh water as afterward covered wide areas in the same region.

Resting directly upon the strata of the Fox Hills Group are those of the Laramie, sedimentation having evidently been continuous from the former, notwithstanding the fact that there was such a radical change in the fauna upon the ushering-in of the Laramie period. The geographical extent of the great Laramie Group has already been referred to, as well as its great thickness, the maximum being about 4,000 feet.

Its general lithological characteristics are similar to those of the Fox Hills Group, a known marine formation, but its fauna, as has been shown, is mainly of brackish-, but partly of fresh-water origin, and not marine. Furthermore, the brackish-water species are distributed throughout its entire thickness and its whole geographical extent. These facts, together with the absence from all the strata yet examined of any true estuary characters, show that the Laramie Group was deposited in a great brackish-water sea. This being the case, it must have received its peculiar character as well as its boundaries by having been separated from the great open sea by an encircling elevation of land. The final act of the inclosing movements was the elevation of land at both the northern and southern end of the intercontinental Mesozoic sea, which connected the two great continental factors, so that that sea became a land-locked one, without material change of its status in its principal portion as regards the continued accumulation of sediments upon its bottom.

Whether the brackish saltness of the Laramie Sea was sustained throughout the period by limited communication of its waters with those of the great open sea, or whether such communication was entirely cut off and the supply of salt, above that which was retained of its original marine saltness, came by adjacent continental drainage in amount sufficient to balance the waste by overflow, can probably never be known, but the latter seems probable. If the former condition existed, one of the places of communication was no doubt at the southeastern border of the Laramie Sea, and some fortunate exposure of strata* in the region between Western Kansas and the Gulf of Mexico may yet reveal the true relations of the Laramie Group with the Cretaceous and Eocene deposits of the Gulf border. If tide-level communication between the Laramie Sea and the open ocean was entirely cut off, as there is much reason to believe it was, the question of such relationship or contemporaneousness of deposition must ever remain an open one.

It is evident that the movements which caused the inclosure of the Laramie Sea did not materially interrupt the continuity of sedimentation within at least a very large part of its area, although the effects of those physical changes were such as to cause a total change in at least the molluscan fauna. The wide geographical distribution and great vertical range of many of the molluscan species of the Laramie Group, and the great uniformity of its lithological characters, show that the period was one of comparative quiet within the region which was occupied by its waters. There were, however, some comparatively slight oscillations of surface or sea-bottom, which caused local unconformity of strata, but these are so limited in extent, so far as they are known, that, at no great distance away from each, the strata, which evidently correspond with the displaced ones, show no evidence of disturbance. An example of such local unconformity exists in the Bitter Creek Series, near its top, in the vicinity of Point of Rocks Station.

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* In Professor Powell's Report on the Geology of the Uinta Mountains, and in the American Journal of Science, vol. xi, 3d series, p. 161, I announced, on the authority of Professor Powell, the existence of marine Tertiary fossils in the strata of the valley of Bijou Creek, 40 miles east of Denver, Colo. A personal examination of that region in 1877 failed to confirm that reported discovery, as I have shown in my report for that year. See An. Rep. U. S. Geol. Surv. Terr. for 1877.

Although the disturbances at or near the close of the Laramie period were greatest in the region of the western border of the Laramie Sea, there were necessarily minor disturbances over a large part of the area which it occupied, because it was no doubt a continuation of continental elevation that narrowed the area of the Laramie Sea and fixed the boundaries of the freshened waters that continued to cover a large part of its former site. The evidence seems conclusive, however, that while there was then at least a slight elevation of that part of the continent, and a freshening of the remaining great body of land-locked waters, sedimentation was not interrupted thereby over a large part of the area occupied by those freshened waters. It is not claimed that the disturbances of strata which marked the change from the Fox Hills Group to the Laramie approached in extent or degree those which occurred at or near the close of the Laramie Group, although there was a radical change in at least the molluscan fauna in both cases; but the facts seem to prove that we have in these western strata, including the great freshwater deposits, an unbroken geological record, extending at least from the earlier Mesozoic far into Tertiary time. The apparent paleontological breaks in that record are regarded as only faunal displacements and restrictions which were caused by radical changes of environment that were consequent upon the different physical changes which took place in the progress of the evolution of the continent.

The already accumulated geological facts show that the general continental elevation was continued after the Laramie period, much in the same manner that it progressed up to that time (for the Rocky Mountains were not yet elevated); still inclosing large bodies of water, but which were no longer salt. The surface of the Laramie Sea was doubtless only slightly, if at all, elevated above the level of the great open sea; but the elevation of its former bed was no doubt considerably increased during its successive occupancy in part by the Wasatch, Green River, and Bridger Lakes. There must, however, have been a subsidence of the bottom of each of these great bodies of fresh water during their existence, which permitted the accumulation of the immense thickness of their strata which now remain, besides that which has been removed by erosion. Free drainage of overflow into the open sea must also have been maintained during these later epochs, which kept their waters fresh, but which evidently did not exist during the Laramie period; but the present discussions are necessarily confined mainly to the last-named period.

In the foregoing discussion of the paleontological characteristics of the

Laramie Group I have had reference almost entirely to the invertebrate fauna, which consists, so far as the discussions are concerned, entirely of the *Mollusca*. This was not because the investigation of those subjects is more in the line of my special studies, but because being inhabitants of the waters in which the formations were deposited, they had a more direct bearing than any others upon the physical phases of the western portion of North America during the period that has been discussed, and, also, because neither the then existing vegetation nor the most important part of the vertebrate fauna was necessarily affected by at least those physical changes which caused an entire change of the whole molluscan fauna, both at the beginning and close of the Laramie period. The reptilian fauna of the Laramie period, however, assumes especial interest, because certain of its types, which extend throughout the whole vertical range of the group, are regarded as characteristic of Cretaceous age.

Notwithstanding the positive opinions that have been expressed by others upon the subject of the geological age of the Laramie Group, I regard it as still an open question. All paleontologists agree that the Cretaceous period extended at least to the close of the Fox Hills epoch; and the question is whether the Cretaceous period closed with the close of the Fox Hills epoch or with that of the Laramie period. The question might be extended so as to embrace the inquiry whether the true chronological division between the Cretaceous and Tertiary did not really occur within the Laramie period; but this, while not unreasonable, would perhaps be inconvenient and unprofitable. That, according to European standards, the *Dinosauria* which are found even in the uppermost strata of the Laramie Group are of Cretaceous types is doubtless indisputable, and there also appears to be no occasion to question the reference that has been made of fossil plants which have been obtained from even the lowest Laramie strata, to Tertiary types. The invertebrate fossils, of the Laramie Group itself, as I have shown in other writings, are silent as to its geological age, because the types are either unique, are known to exist in both Mesozoic and Tertiary strata, or pertain to living as well as fossil forms.* Every species found in the Laramie Group is no doubt extinct, but the molluscan types have collectively an aspect so modern that one almost instinctively regards them as Tertiary; and yet some of these types are now known to have existed in the Cretaceous, and even in the Jurassic period. In view of these facts, together with those presented in the foregoing discussions, the following suggestions concerning the geological age of the Laramie Group are offered.

It is a well-known fact that we have in North America no strata which are, according to European standards, equivalent with any part of the Lower Cretaceous of Europe, but that all North American strata of the Cretaceous period are equivalent with certain portions of those of the Upper Cretaceous of that part of the world. That the Fox Hills Group is of Upper Cretaceous age no one disputes, the only question being as to its place in the series. A comparison of its fossil invertebrate types with those of the European Cretaceous rocks indicates that it is at least as late as, if not later than, the latest known Cretaceous strata of Europe. If, therefore, that parallelism is correctly drawn, and the Laramie Group is really of Cretaceous age, we have a great and important division of the Cretaceous represented in America which is yet unknown in any other part of the world. It is in view of these facts that, for purposes of general grouping of the strata of the Western Territories, the provisional designation of "Post-Cretaceous" has been adopted for the Laramie Group in the reports of this Survey.

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* It is a fact worthy of consideration in this connection that a large proportion of the molluscan types of the extensive fresh-water deposits of Southeastern Europe are practically identical with some of those of the Laramie Group, and that European geologists regard those deposits as of Eocene Tertiary age.

It is well known that able American paleontologists regard the Laramie Group as of Cretaceous age, and this opinion is understood to be based upon the persistence of some vertebrate Cretaceous types up to the close of the Laramie period and the first known appearance of Tertiary types of mammals in North America, in the immediately superimposed Wasatch strata. It is not to be denied that these are important considerations, but the following, as well as other relevant facts already mentioned, ought to be duly considered in that connection.

With rare and obscure exceptions, no mammalian remains are known in North American strata of earlier date than those of the Wasatch Group that were deposited immediately after the close of the Laramie period. Immediately from and after the close of that period, as shown by abundant remains in the fresh-water Tertiaries of the West, highly organized mammals existed in great variety and abundance. There is nothing to forbid the supposition that all of these were constituents of a Tertiary fauna, and many of them are, by accepted standards, of distinctively Tertiary types. If the presence of these forms in the strata referred to, and their absence from the Laramie strata immediately beneath them, together with the presence of Dinosaurians there, be held to prove the Tertiary age of the former strata, then was the Tertiary period ushered in with most unnatural suddenness. Sedimentation was, at least in part, unbroken between the Laramie Group and the strata which contain the mammalian remains referred to, so that the local conditions of the origin of all of them were substantially the same, and yet, so far as any accumulated evidence shows, those mammalia were not preceded in the Laramie period by any related forms. Such suddenness of introduction makes it almost certain that it was caused by the removal of some physical barrier, so that the ground which was before potentially Tertiary, became so, of paleontological record, by actual faunal occupancy. In other words, it seems certain that those Tertiary mammalian types were evolved in some other region before the close of the Laramie period, where they existed contemporaneously with at least the later Dinosaurians, and that the barrier which separated those faunæ was removed by some one of the various surface movements connected with the evolution of the continent. The climate and other physical conditions which were essential to the existence of the Dinosaurians of the Laramie period having evidently been continued into the Tertiary epochs that are represented by the Wasatch, Green River, and Bridger Groups, they might, doubtless, have continued their existence through those epochs as well as through the Laramie period but for the irruption of the mammalian hordes to which they probably soon succumbed in an unequal struggle for existence.

According to the facts which I have here and elsewhere shown, we have in the strata of the Western Territories an unbroken record from the earlier Mesozoic far into Tertiary time, and consequently no complete line or plane of demarkation between them exists. Therefore the designation of any precise boundary between the Cretaceous and Tertiary of that region must be a matter of conventional convenience rather than of natural requirement.

ART. XXXVII.—SYNONYMATIC LIST OF THE AMERICAN SCIURI, OR ARBOREAL SQUIRRELS.

BY J. A. ALLEN.

Since the publication last year of my revision of the American *Sciuri*,* the "Neotropical" species of the group have been ably reviewed by Mr. E. R. Alston,† under unusually favorable circumstances. With his accustomed thoroughness, he has taken the trouble to seek out the types, so far as they are extant or accessible in several of the principal museums of Europe, of most of the species of former authors, and has thus been able to determine the character of many species so inadequately described, that in no other way could their proper allocation be satisfactorily determined. His careful elucidation of this obscure and perplexing group has not only placed his fellow-workers in the same field under lasting obligations to him, but must mark an era in the history of the subject. Of the fifty-nine nominal species of this group described by different authors, he informs us that he has examined the types of no less than forty-one! With the rich material of the British Museum at his command, he has been able to tell us exactly what the late Dr. Gray had for the basis of his *nineteen* "new species", described in a single paper in 1867, some of them so vaguely or inaccurately that the descriptions are sometimes misleading, and often inadequate indices of what he actually had before him. Mr. Alston has also been able to allocate the species described previously by the same author, and by Richardson, Bennett, Ogilby, and other British writers. In the Paris Museum, he found still extant the types of most of the species described many years since by Is. Geoffroy, Lesson, F. Cuvier, and Pucheran, and in the Berlin Museum types of the species described by Dr. Peters; so that the only important ones not seen by him are those of Brandt, Wagner, and Natterer. To assist him in collating my own work, I had the pleasure of sending him examples of the greater part of the species recognized by me in my recent monograph of the American *Sciuridæ*. As I had not access to the types of the species described by foreign authors, I made, in some instances, my allocations of synonymy with doubt, and, in other cases, only provisionally, feeling conscious of the uncertainty with which references to many of the species must necessarily, under the circumstances, be made. Although Mr. Alston has shown the incorrectness of some of my identifications, and the necessity of substituting, in two instances, names other than those I was led to adopt, I feel, on the whole, no small degree of satisfaction in the confirmation of so large a portion of my synonymic work by the trying ordeal to which it has been submitted; especially as Mr. Alston has done me the kindness to state, in several instances, that I was led into mistakes by descriptions that did not properly represent the objects described. The purpose of the present paper is to correct these errors, so far as they have been satisfactorily shown, and to present a nomenclature that fairly reflects the present state of the subject.

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* Coues and Allen's "Monographs of North American Rodentia", pp. 666-797, August, 1877.

† "On the Squirrels of the Neotropical Region", Proc. Zoöl. Soc. Lond. 1878, pp. 656-670, pl. xli. This highly important memoir gives excellent diagnoses of the species, with their synonymy in full, and a critical commentary on the species of previous authors.

In my former revision of the *Sciuri* of Tropical America, I felt authorized in reducing fully four-fifths of the previously described species to synonyms, and stated it as my belief that I had still recognized too many rather than too few. Mr. Alston, with far more—and mainly historic—material at his command, has, in one or two instances, carried the reduction still further, but, on the other hand, has added one or two species unrepresented in the material I had before me. While I recognized ten species and two subspecies, he has raised the number of the former to twelve. The changes, so far as species are concerned, consist in his elevating one of my subspecies to full specific rank; in treating as a species a form I regarded as the young of another species; in uniting, in two instances, two of my species into one; and in restoring two species I treated as nominal. These changes, as well as those of nomenclature and synonymy, will be fully noted in the following pages.

For the purpose mainly of presenting a connected view of the American *Sciuri*, but partly to correct one or two errors of synonymy, I include the North American species in the subjoined enumeration, although I have no changes to make in the nomenclature adopted in "Monographs of North American Rodentia". In order to distinguish readily those that are represented in the North American fauna, I divide the species, as before, into two geographical series. Gray's species are assigned in accordance with Mr. Alston's determinations, based on an examination of the types, as are also those of Peters, Pucheran, Cuvier, Geoffroy, Bennett, and Richardson. Consequently the synonymatic tables here presented are substantially the same as Mr. Alston's.

A.—NORTH AMERICAN SPECIES.

I.—SCIURUS HUDSONIUS, Pallas.

1.—Var. hudsonius.

Sciurus vulgaris, FORSTER, Phil. Trans. lxii, 1772, 378.
Sciurus vulgaris, *ε*, *hudsonicus*, ERXLEBEN, Syst. Anim. 1777, 416.
Sciurus hudsonius, PALLAS, Nov. Spec. Glires, 1778, 376.
Sciurus carolinus, ORD, "Guthrie's Geogr. (2d Am. ed.) ii, 1815, 292."
Sciurus rubrolineatus, DESMAREST, Mam. ii, 1822, 333.

2.—Var. richardsoni.

Sciurus richardsoni, BACHMAN, Proc. Zoöl. Soc. Lond. vi, 1838, 100.

3.—Var. douglassi.

Sciurus hudsonius, var. *β*, RICHARDSON, Faun. Bor.-Am. i, 1829, 190.
Sciurus douglassi, GRAY, Proc. Zoöl. Soc. Lond. 1836, 88 (no description).—BACHMAN, Proc. Zoöl. Soc. Lond. 1838, 99.
Sciurus townsendi, BACHMAN, Journ. Acad. Nat. Sci. Phila. viii, 1839, 63 (MS. name).
Sciurus lanuginosus, BACHMAN, Proc. Zoöl. Soc. Lond. 1838, 101.
Sciurus mollipilosus, AUDUBON & BACHMAN, Proc. Acad. Nat. Sci. Phila. i, 1842, 102.
Sciurus belcheri, GRAY, Ann. and Mag. Nat. Hist. x, 1842, 263.
Sciurus suckleyi, BAIRD, Proc. Acad. Nat Sci. Phila. vii, 1855, 333.

4.—Var. fremonti.

Sciurus fremonti, AUDUBON & BACHMAN, Quad. N. Amer. iii, 1853, 237, pl. cvlix, fig. 1.

II.—SCIURUS CAROLINENSIS, Gmelin.

1.—Var. leucotis.

Sciurus cinereus, SCHREBER, Säuget. iv, 1792, 706, pl. ccxii (*nec* Linné, 1758).
Sciurus pennsylvanicus, ORD, "Guthrie's Geog. (2d Am. ed.) ii, 1815, 292" (melanistic).
Sciurus niger, GODMAN, Am. Nat. Hist. ii, 1826, 133 (melanistic; *nec* Linné, 1758).
Sciurus carolinensis, GODMAN, Am. Nat. Hist. ii, 1826, 131.
Sciurus leucotis, GAPPER, Zoöl. Journ. v, 1830, 206, pl. xi.
Sciurus vulpinus, DEKAY, N. Y. Zoöl. i, 1842, 59.
Sciurus migratorius, AUDUBON & BACHMAN, Quad. N. Amer. i, 1849, 265, pl. xxxv.

2.—Var. carolinensis.

Sciurus carolinensis, GMELIN, Syst. Nat. i, 1788, 148.
Sciurus fuliginosus, BACHMAN, Proc. Zoöl. Soc. Lond. 1838, 96.

3.—Var. yucatanensis.

Sciurus carolinensis var. *yucatanensis*, ALLEN, Mon. N. Am. Rod. 1877, 705.

NOTE.—In "Monographs of the North American Rodentia", p. 701, exclude from synonyms of var. *leucotis*, "*?* *Macroxus melania*, Gray", and from synonyms of var. *carolinensis* exclude "*? Sciurus deppei*", respecting which see *infrà*, pp. 881, 885. Variety *yucatanensis* seems to be a rare form in collections, Mr. Alston stating that the only specimen he has seen being the one I sent him.

III.—SCIURUS NIGER, Linné.

1.—Var. niger.

Sciurus niger, Linné, Syst. Nat. i, 1758, 64.
Sciurus variegatus, ERXLEBEN, Syst. Anim. 1777, 421 (in part).
Sciurus vulpinus, GMELIN, Syst. Nat. i, 1788, 147.
Sciurus capistratus, BOSC, Ann. du Mus. i, 1802, 281.
Sciurus rufiventris, M'MURTRIE, Cuvier's An. King. (Am. ed.) i, 1831, 433.
Sciurus texianus, BACHMAN, Proc. Zoöl. Soc. Lond. 1838, 86.

2.—Var. cinereus.

Sciurus cinereus, LINNÉ, Syst. Nat. i, 1758, 64.
Sciurus vulpinus, SCHREBER, Säuget. iv, 1792, 772, pl. ccxv, B.

? *Sciurus hyemalis*, ORD, "Guthrie's Geog. (2d Am. ed.) ii, 1815, 293, 304."
?? *Macroxus neglectus*, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 425 (locality unknown).

3.—Var. ludovicianus.

Sciurus ludovicianus, CUSTIS, Barton's Med. and Phys. Journ. ii, 1806, 43.
Sciurus ludovicianus var. *atroventris*, ENGELMANN, Trans. Acad. Sci. St. Louis, i, 1859, 329.
Sciurus macroura, SAY, Long's Exp. R. Mts. i, 1823, 115.
Sciurus macroureus, GODMAN, Am. Nat. Hist. ii, 1826, 134.
Sciurus magnicaudatus, HARLAN, Faun. Am. 1825, 178.
Sciurus subauratus, BACHMAN, Proc. Zoöl. Soc. Lond. 1838, 87.
Sciurus auduboni, BACHMAN, Proc. Zoöl. Soc. Lond. 1838, 97.
Sciurus occidentalis, AUDUBON & BACHMAN, Journ. Acad. Nat. Sci. Phila. viii, 1842, 317.
Sciurus rubicaudatus, AUDUBON & BACHMAN, Quad. N. Am. ii, 1851, 30, pl. lv.
Sciurus sayi, AUDUBON & BACHMAN, Quad. N. Am. ii, 1851, 274, pl. lxxxix.
Sciurus limitis, BAIRD, Proc. Acad. Nat. Sci. Phila. vii, 1855, 331.

NOTE.—Under Var. *ludovicianus*, Mon. N. Am. Rod. p. 718, exclude "? TOMES, Proc. Zoöl. Soc. Lond. 1861, 281 (Costa Rica [*lege* Guatemala])".

IV.—SCIURUS FOSSOR, Peale.

Sciurus fossor, PEALE, Mam. and Birds U. S. Expl. Exp. 1848, 55.
Sciurus heermanni, LECONTE, Proc. Acad. Nat. Sci. Phila. vi, 1852, 149.

V.—SCIURUS ABERTI, Woodh.

Sciurus dorsalis, WOODHOUSE, Proc. Acad. Nat. Sci. Phila. vi, 1852, 110 (*nec* Gray, 1848).
Sciurus aberti, WOODHOUSE, Proc. Acad. Nat. Sci. Phila. vi, 1852, 220.
Sciurus castanotus, BAIRD, Proc. Acad. Nat. Sci. Phila. vii, 1855, 332 (typ. error for *castanonotus*).

VI.—SCIURUS ARIZONENSIS, Coues.

Sciurus arizonensis, COUES, Amer. Nat. i, 1867, 357.
Sciurus colliæi, ALLEN, Mon. N. Am. Rod. 1877, 738 (exclusive of synonyms, which all belong to the next species, except "? *S. leporinus*, AUD. & BACH.", which is indeterminable).

NOTE.—"Misled by imperfect descriptions and a bad figure of Richardson's type, Mr. Allen has referred the Arizona Squirrel of Dr. Coues to Richardson's *S. colliæi*. He has since kindly intrusted me with a typical example of *S. arizonensis*; and I find that it is quite distinct from *S. colliæi* (which is Mr. Allen's *S. boothiæ*), being much more nearly allied to *S. carolinensis*, from which, however, both Dr. Coues and Mr. Allen consider that it is 'thoroughly distinct'."—ALSTON, *l. c.* p. 659.

B.—SPECIES OF MEXICO AND CENTRAL AND SOUTH AMERICA.

VII.—SCIURUS GRISEOFLAVUS, (Gray) Alston.

Macroxus griseoflavus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1877, 427.
Sciurus griseoflavus, ALSTON, Proc. Zoöl. Soc. Lond. 1878, 660.
? *Sciurus ludovicianus*, TOMES, Proc. Zoöl. Soc. Lond. 1861, 281 (according to Alston, *l. c.* p. 660).

NOTE.—Referred by me to my *S. leucops*. Considered by Mr. Alston to be "closely allied" to *S. arizonensis*, of which he suspects "it will eventually prove to be a southern race. More specimens, however, are required before they can be united; and provisionally I therefore accept *S. griseoflavus* as a distinct species." My own inclination, in view of Mr. Alston's diagnosis of *S. griseoflavus*, is to unite them, but I refrain from doing so at present.

Mr. Alston further remarks:—" Mr. Allen considers Gray's *M. griseoflavus* to be specifically identical with his [Allen's] *M. leucops;* and the original diagnosis certainly seems to give countenance to such a view. The typical specimens (five in number), however, are very different. . . ." In consequence of my referring Gray's *Macroxus griseoflavus* to my *S. leucops*, he quotes the latter as a synonym of *S. griseoflavus*, Alston, but the specimens I referred to my *S. leucops* represent his *S. variegatus* var. *leucops.*

VIII.—SCIURUS HYPOPYRRHUS, Wagler.

? *Sciurus variegatus*, ERXLEBEN, Syst. Anim. 1777, 421 (in part).
Sciurus hypopyrrhus, WAGLER, Isis, 1831, 610.
Sciurus nigrescens, BENNETT, Proc. Zoöl. Soc. Lond. 1833, 41 (melanistic).
Sciurus colliæi, RICHARDSON, Zoöl. Voy. Blossom, 1839, 8, pl. i.
Sciurus variegatoides, OGILBY, Proc. Zoöl. Soc. Lond. 1839, 117.
Sciurus richardsoni, GRAY, Ann. and Mag. Nat. Hist. x, 1842, 264 (*nec* Bachman, 1838).
Sciurus boothiæ, GRAY, List Mam. Brit. Mus. 1843, 139 (=*S. richardsoni*, Gray).
Sciurus griseocaudatus, GRAY, Zoöl. Voy. Sulphur, 1844, 34, pl. xiii, fig. 2 (animal), pl. xviii, figs. 7–12 (skull and teeth).
Sciurus fuscovariegatus, SCHINZ, Synop. Mam. 1845, 15 (= *S. richardsoni*, Gray).
Sciurus adolphei, LESSON, Descrip. de Mam. et d'Ois. 1847, 141.
Sciurus pyladei, LESSON, Descrip. de Mam. et d'Ois. 1847, 142.
Sciurus dorsalis, GRAY, Proc. Zoöl. Soc. Lond. 1848, 138, pl. vii.
Sciurus rigidus, PETERS, Monatsb. Köngl. Preuss. Akad. Wissensch. zu Berlin, 1863, (1864), 652.
Sciurus oculatus, PETERS, Monatsb. Köngl. Preuss. Akad. Wissensch. zu Berlin, 1863, (1864), 653 (formerly referred by me to my "*S. colliæi*" =*S. arizonensis*, Coues).
Sciurus intermedius, " VERREAUX ", GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 421.
Sciurus nicoyana, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 423.
Sciurus melania, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 425 (formerly referred by me, with a query, to *S. carolinensis*).
Sciurus colliæi, ALLEN, Mon. N. Am. Rod. 1877, 738 (the synonyms, except *S. arizonensis*, Coues, but not the specimens, nor the descriptive text).
Sciurus boothiæ, ALLEN, Mon. N. Amer. Rod. 1877, 741 (synonyms, text, and specimens).
Sciurus hypopyrrhus, ALLEN, Mon. N. Amer. Rod. 1877, 746 (synonyms,—except *Macroxus maurus*, Gray,—text, and specimens, except the series from Guayaquil and the text relating to them).

NOTE.—This species, as at present defined, includes both my *S. boothiæ* and *S. hypopyrrhus*, except certain specimens from Guayaquil described by me under the latter name, which represent, according to Mr. Alston's determination of them, *S. stramineus.* In uniting my *S. boothiæ* and *S. hypopyrrhus*, Mr. Alston confirms a suspicion I had already expressed of their possibly proving identical. I kept them apart mainly from the impression made upon me by the Guayaquil specimens, which I felt pretty sure were specifically different from those I referred to *S.*

boothiæ, and which were really the basis of what I recognized as *S. hypopyrrhus*. I associated with them, however, specimens representing the *S. dorsalis* of Gray, from their apparently slenderer form and relatively longer ears and tail. Although Mr. Alston has not seen the types of either Wagler's *S. hypopyrrhus* or of *S. stramineus*, I defer for the present to his judgment in adopting *hypopyrrhus* as the name of this highly polymorphic group.

Under *S. hypopyrrhus*, Mr. Alston recognizes five "types", namely:—1. "The *hypopyrrhus* type", to which he refers *S. nigrescens*, Bennett, and *Macroxus boothiæ*, Gray, 1867. 2. "The *rigidus* type", to which he refers *S. rigidus*, Peters, *S. intermedius*, Verreaux, and *S. nicoyanus*, Gray. 3. "The *dorsalis* type." 4. "The *colliæi* type", to which he refers *S. colliæi*, Richardson, *S. adolphei* and *S. pyladei*, Lesson, *S. variegatoides*, Ogilby, *S. oculatus*, Peters, and *S. griseocaudatus*, Gray. 5. "The *melania* type."

"With regard to the synonymy," Mr. Alston writes, "I may observe that I have been able to examine the types of all the 'species' here united, excepting that of *S. hypopyrrhus*, which, however, has been well described by Wagler and Wagner; it appears to be a dark variety without the usual wash of white on the tail. . . ."

"Of the geographical distribution of the races," he says, "we can only judge from the comparatively few specimens of which the exact localities have been noted. The *hypopyrrhus* phase appears to be the most northern, the *colliæi* to obtain principally along the Pacific slopes, and the *dorsalis* to be the most southern. Each, however, appears to be found along with the others in some parts. Thus, I have seen specimens of the *hypopyrrhus* type from Mexico, Honduras, and Guatemala, of *rigidus* from Guatemala, Nicaragua, and Costa Rica, of *dorsalis* from Nicaragua, Costa Rica, Veragua, and Panama, and of *colliæi* from the west coast of Mexico and Guatemala, Nicaragua, and Costa Rica. The only localities which I know for *S. melania* are Nicaragua and Veragua."* In all probability, these five types will prove to be entitled to varietal rank.

IX.—SCIURUS AUREIGASTER, F. Cuvier.

Sciurus aureogaster, F. CUVIER, Hist. des Mam. iii, livr. lix, 1829.

Sciurus leucogaster, F. CUVIER, Suppl. de Buff. i, Mam. 1831, 300.

Sciurus albipes, WAGNER, Abh. Bayer. Ak. ii, 1837, 501 (according to Alston; formerly referred by me, with a ?, to the preceding species).

Sciurus socialis, WAGNER, Abh. Bayer. Ak. ii, 1837, 504, pl. v (according to Alston).

Sciurus ferruginiventris, AUDUBON & BACHMAN, Proc. Acad. Nat. Sci. Phila. 1841, 101; Quad. N. Am. pl. xxxviii.

Sciurus varius, WAGNER, Suppl. Schreber's Säuget. iii, 1843, 168, pl. cccxiii D ("*S. albipes*" on plate; = *S. albipes*, Wagner, 1837).

Macroxus morio, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 424.

Macroxus maurus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 425 (formerly referred by me to the preceding species).

Macroxus leucops, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 427.

Sciurus aureigaster and *S. leucops*, ALLEN, Mon. N. Am. Rod. 1877, 750, 753.

Sciurus variegatus, ALSTON, Proc. Zoöl. Soc. Lond. 1878, 660 (*ex* Erxleben).

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* *Loc cit.* pp. 663, 664.

NOTE.—"Under this name I feel myself obliged to bring together two Mexican Squirrels of which typical specimens are very different in appearance. Mr. Allen has kept them separate under the names of *S. aureigaster* and *S. leucops*, remarking that the difference in coloration leaves little doubt of their distinctness, but adding that 'more abundant material may show that they are not specifically separable' (*op. cit.* p. 755). The color-variation is not nearly so great as we shall find it to be in the next species [*i. e. S. hypopyrrhus*]; and after a careful examination of a great number of specimens, especially of the fine series in the Paris Museum, I have been unable to find a single distinctive character which is constant."—ALSTON, *l. c.* p. 661.

Of this species Mr. Alston recognizes two forms, denominated respectively "1, the *aureogaster* type", and "2, the *leucops* type".

Unfortunately, as it seems to me, Mr. Alston has selected for this species Erxleben's name *variegatus*, remarking that it is "primarily founded" on the "Coztiocotequallin" of Hernandez, and that Buffon's "Coquallin" is quoted only as a synonym; and adds, "Erxleben's diagnosis and description appear to me to be quite characteristic of the *leucops* form of the present species. By retaining this appropriate name," he continues, "we are enabled to escape from F. Cuvier's barbarous term *aureogaster*, under which this beautiful species has labored in so many works" (*l. c.* pp. 661, 662). However pleasant it might be to escape Cuvier's barbarous name, this to me is not so clearly the way to do it. Erxleben's species is admittedly a composite one, and neither his diagnosis nor Hernandez's account of the "Coztiocotequallin" helps the matter, since the best that can be made out is that Erxleben's species was black above, varied with white and brown, and yellow below, twice the size of the European Squirrel, and with the ears not tufted; a characterization broad enough to apply to the dusky phase of any of the larger Mexican Squirrels. F. Cuvier's excellent figure and detailed description, on the other hand, leave nothing to be guessed at in respect to just what his *aureogaster* was, the types of which, it appears also, are still preserved.

X.—SCIURUS STRAMINEUS, Eyd. & Soul.

Sciurus stramineus, EYDOUX & SOULEYET, Voy. de la Bonite, Zool. i, 1844, 37, pl. ix.
Sciurus nebouxii, IS. GEOFFROY, Voy. de La Vénus, Zool. 1855, 163, pl. xii.
Macroxus fraseri, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 430.
Sciurus hypopyrrhus, ALLEN, Mon. N. Am. Rod. 1877, 747 (in part).

NOTE.—As already stated, this species was embraced under my *S. hypopyrrhus*. The *S. stramineus* I included among the synonyms of *S. variabilis*. The *S. nebouxii* I was unable to identify, and gave it among my undetermined species. The *Macroxus fraseri* I referred doubtfully to *S. tephrogaster*.* Mr. Alston has examined the types of *S. nebouxii* and

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* "It is only fair to Mr. Allen to add, that Gray's description of *M. fraseri* is so imperfect that it is not surprising that the American zoölogist should have doubtfully referred it to *S. tephrogaster*."—ALSTON, *l. c.* p. 665.

S. fraseri, and their allocation here is on his authority. It turns out that the Guyaquil specimens of my *S. hypopyrrhus* series (one of which Mr. Alston has seen) represent this species. Mr. Alston states that this species is rare in collections, and appears to be the only representative of the genus in Western Peru. He further says:—"A remarkable peculiarity of this species is its tendency to the development of irregular tufts of pure white hairs, rather longer than the rest of the fur, and sometimes uniting in large patches. These asymmetrical markings are present in the majority of the individuals examined." This peculiarity in the texture and color of the pelage I looked upon as abnormal and as indicating a tendency to albinism, and am surprised that it should prove of such general occurrence.

XI.—SCIURUS VARIABILIS, Is. Geoffroy.

Sciurus variabilis, Is. GEOFFROY, Mag. de Zool. 1832, i, pl. iv.
Sciurus langsdorffi, BRANDT, Mém. Acad. de St. Pétersb. 6^e sér. Math. Phys. et Nat. iii, 2^e pt. 1835, 425, pl. xi.
Sciurus igniventris, "NATTERER", WAGNER, Wiegm. Arch. für Naturg. 1842, i, 360.
Sciurus pyrrhonotus, "NATTERER", WAGNER, Wiegm. Arch. für Naturg. 1842, i, 360.
Sciurus tricolor, "PÖPPIG", TSCHUDI, Faun. Peruan. 1844–46, 156, pl. xi.
Sciurus morio, WAGNER, Abh. Bayer. Ak. v, 1 50, 275.
Macroxus gerrardi, GRAY, Proc. Zoöl. Soc. Lond. 1861, 92, pl. xvi.
Sciurus brunneo-niger, "CASTLENAU", GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 429.
Sciurus fumigatus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 428.
Sciurus variabilis and *S. gerrardi*, ALLEN, Mon. N. Am. Rod. 1877, 768, 766.

NOTE.—Mr. Alston extends this species to cover my *S. gerrardi*, which I separated mainly on the ground of smaller size. He says:—"Here, again, the greater amount of material compels me to go beyond Mr. Allen in the identification of nominal species. Most of the above synonyms were brought together by him under the name of *S. variabilis*; but *S. gerrardi* and *S. rufo-niger* [*lege brunneo-niger*] were kept separate under the former title. The principal points on which he rested were the smaller size and shorter ears of *S. gerrardi;* but on examination of a sufficient series, I have not been able to find any constancy in the proportions of the ears, while the difference in size totally disappears. . . . The smaller specimens (*S. variabilis*, *S. gerrardi*, etc.) appear to prevail towards the north; but this is not constant. . . . Nor is it constantly connected with any of the numerous varieties of coloration—rufous, grizzled, and melanistic specimens occurring of all sizes." These color-variations, he says, seem to resolve themselves into three primary groups, namely:—"1, the *morio* type", melanistic; "2, the *variabilis* type", red, varied with black; "3, the *langsdorffi* type", reddish- or yellowish-grizzled. Each of these types seems to prevail in certain localities, but there is no regularity in their distribution, the red and grizzled often occurring together.

Our synonymy of this variable group agrees, except that I included *S. stramineus* under *variabilis*, and Gray's *Macroxus xanthotus* under *S. gerrardi*, which latter Mr. Alston refers to *S. griseogenys* (= *Sciurus* *æstuans* var. *rufo-niger*, Allen), with the remark, "By some curious error Gray's account of this last (*Macroxus xanthotus*) has been printed after that of *M. brunneo-niger*, instead of after *M. griseogena;* so that the remark, 'very like the former', etc., naturally led Mr. Allen to refer the synonym to *S. gerrardi*" (*l. c.* p. 667).

XII.—SCIURUS DEPPEI, Peters.

Sciurus deppei, PETERS, Monatsb. K.-P. Ak. Wissen. Berlin, 1863, (1864), 654 (formerly referred by me, with a ?, to *S. carolinensis*).

Macroxus tephrogaster, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 408.

Macroxus middellinensis, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 408.

Macroxus tæniurus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 431.

Sciurus tephrogaster, ALLEN, Mon. N. Am. Rod. 1877, 763 (excluding "?*Macroxus fraseri*, Gray").

NOTE.—The examination of the type of *S. deppei*, Peters, by Mr. Alston, shows it to be identical with Gray's *M. tephrogaster*, over which it has three years' priority. "As already observed," says Mr. Alston, "*M. fraseri*, Gray, was so insufficiently described that Mr. Allen was led to identify it with the present species, which is about half its size and totally different in coloration" (*l. c.* p. 669).

XIII.—SCIURUS ÆSTUANS, Linné.

Sciurus æstuans, LINNÉ, Syst. Nat. i, 1766, 88.

Sciurus æstuans var. *guanensis* PETERS, Monatsb. K.-P. Akad. Wissens. Berlin, 1863, (1864), 655.

Myoxus guerlingus, SHAW, Gen. Zoöl. ii, 1801, 171, pl. clvi.

Sciurus gilvigularis, "NATTERER", WAGNER, Wiegm. Arch. für Naturg. 1843, ii, 43; *ib.* 1845, i, 148.

Macroxus leucogaster, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 430.

Macroxus irroratus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 431.

Macroxus flaviventer, "CASTELNAU", GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 432.

Sciurus æstuans var. *æstuans*, ALLEN, Mon. N. Am. Rod. 1877, 756 (exclusive of "? *S. pusillus*, Geoffroy", and "*M. kuhli*, Gray", and inclusive of "*M. irroratus*, Gray", referred to var. *rufoniger*).

NOTE.—"*M. irroratus* must also be placed here, although the original description is such that Mr. Allen unhesitatingly referred it to the last species [*S. griseogenys*]."—ALSTON, *l. c.* p. 668.

XIV.—SCIURUS HOFFMANNI, Peters.

Sciurus æstuans var. *hoffmanni*, PETERS, Monatsb. K.-P. Ak. Wiss. Berlin, 1863, (1864), 654.

Sciurus hyporrhodus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 419.

Macroxus xanthotus, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 429.

Macroxus griseogena, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 429.

Sciurus griseogenys, ALSTON, Proc. Zoöl. Soc. Lond. 1878, 667.

Sciurus æstuans var. *rufoniger*, ALLEN, Mon. N. Am. Rod. 1877, 757 (excluding *S. rufoniger* and *S. chrysosurus*, Pucheran, and adding *M. xanthotus*, Gray, formerly referred to *S. gerrardi*).

NOTE.—"Mr. Allen, in his monograph, regards this Squirrel as a 'variety' or geographical race of the next species [*i. e. S. æstuans*], differing in its uniformly larger size and strikingly in the coloration of its tail. In a subsequent letter to me he says:—'It would perhaps be just as well to recognize it as entitled to specific rank, although I still feel sure of their intergradation.' That such connecting links may yet be found seems very probable; but I have not been able to find such in the very large series which I have examined, and am consequently compelled to keep them provisionally distinct. Unfortunately Mr. Allen has identified this species with Pucheran's *S. rufo niger*, which, as will be seen presently, is a much smaller and quite distinct species. Dr. Peters described it only as a variety of *S. æstuans;* and though specimens in the Berlin Museum are labelled '*Sciurus hoffmanni*', the name remains a manuscript one. Of Gray's three titles I have adopted *griseogena* (more correctly *griseogenys*) as being simultaneous in date with the others, and as indicating the typical form."—ALSTON, *l. c.* p. 667.

Accepting provisionally this Squirrel as specifically distinct from *S. æstuans*, I dissent from the foregoing only respecting its proper title. Although the name *hoffmanni* may remain a manuscript one as applied in a specific sense, its publication as a varietal name for this form, three years prior to the publication of Gray's names, appears to me to warrant its use as a specific designation for the same form. Such a procedure has certainly the sanction of numerous precedents.

XV.—SCIURUS RUFONIGER, Pucheran.

Sciurus rufoniger, PUCHERAN, Rev. de Zoöl. 1845, 336.—ALSTON, Proc. Zoöl. Soc. Lond. 1868, 669.
Sciurus chrysurus, PUCHERAN, Rev. de Zool. 1845, 337.
"*Macroxus tephrogaster minor*, GRAY, MSS." *apud* Alston.

NOTE.—This species I introduce entirely on the authority of Mr. Alston, who has examined the types. I referred both of Pucheran's species unhesitatingly to the preceding species, but the presence of two upper premolars in *S. rufoniger* would seem to render it unquestionably distinct from *S. hoffmanni*, and to ally it with *S. deppei* (as perhaps the young of that species).

Respecting this species, Mr. Alston remarks as follows:—"On examining the type of Pucheran's *S. rufo-niger* in the Paris Museum, I found that it was not identical with *S. griseogenys* [*S. æstuans* var. *rufoniger*, Allen, Mon. N. Am. Rod.], as Mr. Allen supposed, but rather allied to *S. deppei* [*S. tephrogaster*, Allen, *l. c.*]; and I soon recognized in it a small Squirrel from Panama, and which I had begun to fear would require a new name. These examples prove to agree further with *S. deppei* in having two upper premolars, but differ in being more than one third smaller, in the color of the lower parts (which are only paler than the upper, save on the breast), and in the tail being nearly uniform in color with the back (the hairs having only very minute white or yellow tips). Specimens in the British Museum are labelled *M. tephrogaster minor;* but I cannot doubt the distinctness of the form. The type of *S. rufo-*

niger has the middle of the back nearly black; while that of *M chrysosurus* appears to be a variety, merely differing in the tail being more rufous" (*l. c.* p. 669). There is nothing in Pucheran's description of the last-named species to indicate it is not the young of *S. hoffmanni.*

Judging from what I have seen in other species, the darker color of the lower surface in Alston's *S. rufoniger* as compared with *S. deppei* might result from immaturity; but in deference to Mr. Alston's opinion, grounded on excellent opportunities for deciding, I give the species provisional recognition.

XVI.—SCIURUS PUSILLUS, Geoffroy.

Sciurus pusillus, "IS. GEOFFROY", DESMAREST, Dict. d'Hist. Nat. x, 1817, 109; Mam. 1822, 337, pl. lxxvii, fig. 2.—ALSTON, Proc. Zoöl. Soc. Lond. 1878, 670 pl. xli.
Macroxus kuhli, GRAY, Ann. and Mag. Nat. Hist. 3d ser. xx, 1867, 433.

NOTE.—These names—the first with a query, the second unhesitatingly—I referred in my monograph to *S. æstuans*, influenced mainly by the strong aspect of immaturity presented by a specimen in the Museum of Comparative Zoölogy, which undoubtedly represents this species, notwithstanding the statement by Buffon, quoted by me, that the type of the species was shown by the sexual organs to be adult. Although Mr. Alston was unable to find the type of Geoffroy's *S. pusillus*, he seems to have established its distinctness from *S. æstuans* by finding two upper premolars in the British Museum specimens bearing that name. He considers Gray's *M. kuhli* (which I treated also as the young of *S. æstuans*) as unquestionably identical with *S. pusillus*. This is apparently a very rare species, as I have met with references to not more than half a dozen specimens in all. It is by far the smallest American species of *Sciurus*.

The subjoined summary indicates the changes in nomenclature here made from that adopted in "Monographs of North American Rodents", and also that employed by Mr. Alston in his recent paper "On the Squirrels of the Neotropical Region":—

Allen, November, 1878.	Alston, October, 1878.	Allen, August, 1877.
S arizonensis	S. arizonensis	S. colliæi.
S. griseoflavus	S. griseoflavus	———
S. hypopyrrhus	S. hypopyrrhus	S. hypopyrrhus. S. boothiæ.
S. aureigaster	*S. variegatus*	S. aureigaster. S. leucops.
S. stramineus	S. stramineus	S. hypopyrrhus.
S. variabilis	S. variabilis	S. variabilis. S. gerrardi.
S. deppei	S. deppei	S. tephrogaster.
S. æstuans	S. æstuans	S. æstuans var. æstuans.
S. hoffmanni	*S. griseogenys*	S. æstuans var. rufoniger.
S. rufoniger	S. rufoniger	———
S. pusillus	S. pusillus	S. æstuans.

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*P. S.—SCIURUS RUFONIGER, *Pucheran*.—Since the paper on *Sciuri* passed out of my hands I have received, through the kindness of Mr. E. R. Alston, one of the types of his *Sciurus rufoniger*, endorsed on the label, "Compared with Pucheran's type in Paris Museum. E. R. A. April, 1878." This specimen, as shown by the sexual organs, is a fully adult male, though scarcely five and a half inches long, and hence cannot be regarded as an immature example of *S. deppei*, the possibility of which is above suggested. In coloration it differs little from frequent examples of *S. hoffmanni*. The tail, however, is relatively much shorter, the size nearly one-half less, and it has two upper premolars (Alston) instead of one. In this last feature, as well as in size, proportions, and coloration, it finds a near affine in *S. pusillus*.—J. A. A., Nov. 23, 1878.

[*NOTE.—The above was received too late for insertion in its proper place, the Bulletin having been worked to p. 887.—ED.]

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